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PINONIC ACID AS A MERCERIZING PENETRANT

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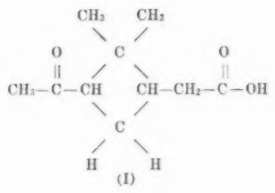
Pinonic acid, a potentially cheap organic acid derivable from turpentine, when mixed with butyl cellosolve was found to be an effective wetting agent for cotton in strong caustic solutions and compares favorably with cresylic acid-butyl cellosolve mixtures when tested in accordance with tentative test method 43-52, Evaluation of Penetrants for Mercerization, of the American Association of Textile Chemists and Colorists.

Almost instantaneous wetting speeds, 1.5 sec or less, of cotton over a range of caustic concentrations and temperature suggest that pinonic acid might be useful as a mercerizing penetrant. Practical mercerizing tests to evaluate such factors as stability, foaming tendency, caustic recovery, exhaustion rate, effect in cotton, etc, have not been determined yet. Although there is no commercial source for pinonic acid, it is conceivable that it could be produced economically in large scale and compete with cresylic acid in this use.

PINONIC acid is obtained from alpha-pinene, a major constituent of gum turpentine, by oxidation with ozone (*1*) or potassium permanganate (*2*). Investigations in this Laboratory to develop uses for this product and thereby increase the consumption of turpentine have resulted in a number of good potential uses. During these investigations, it was suggested that pinonic acid might be useful as a mercerizing penetrant.

Preliminary tests indicated that mixtures of pinonic acid, represented by Formula I, and butyl cellosolve were effective wetting agents for cotton in strong caustic solutions used for mercerization.

[1] One of the laboratories of the Southern Utilization Research and Development Division, U S Department of Agriculture, Agricultural Research Service.



(I)

Figure 1 shows the variations of wetting times with composition for these mixtures. All tests were performed at a temperature of 26°C using caustic concentrations of 285 gm NaOH per liter of solution in accordance with tentative test method 43-52, Evaluation of Penetrants for Mercerization, of the American Association of Textile Chemists and Colorists (*3*), except where caustic

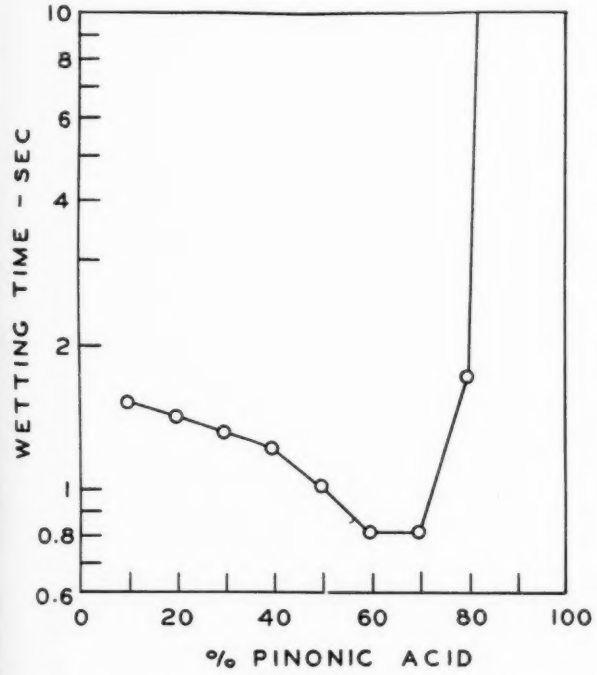


Figure 1
Wetting time vs composition for mixtures of pinonic acid and butyl cellosolve.

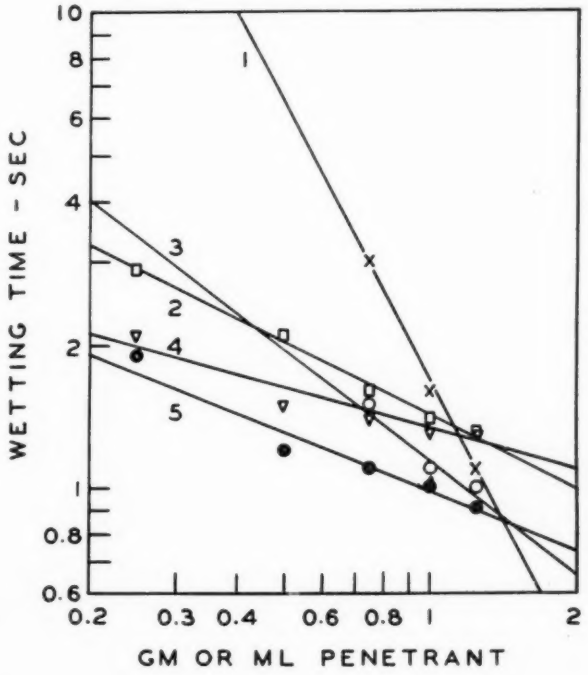


Figure 2
Wetting time vs gm or ml of penetrant for 100 ml caustic. See Table I for penetration compositions.

strength or temperature only was varied.

The acid is a C_{10} monobasic acid containing a carbonyl group capable of forming, in strong caustic solutions, a sodium salt of both the carboxylic acid and the enol of the ketone. It is believed that a certain amount of the enol salt is required for wetting; otherwise, the acid, because of the common ion effect, would not have the desired solubility for effective wetting. At any rate, other carboxylic acids having C_8, C_{10} and C_{12} carbon chains are not good in this respect. However, caproic acid is a particularly good wetting agent. The behavior of carboxylic acids is undoubtedly due to a relationship of molecular weight, configuration and solubility.

A typical large-scale procedure for the preparation of crude pinonic acid by the oxidation of alpha-pinene with permanganate has been described by Loeblich et al (*4*). The reaction produces a mixture of acidic and non-acidic materials having poor wetting properties. If the non-acidic materials are removed by chloroform extraction prior to acidification and isolation of the product, a crude pinonic acid comprising a number of isomers is obtained. This crude material was only about one-third as effective in wetting as the pure *cis*-d, l isomer obtained by the recrystallization of the crude acid from acetone.

In the evaluation, pinonic acid was compared with cresylic acid. Neither of these, per se, were good wetting agents. However, when combined with butyl cellosolve in the proper proportions, enhancement of the wetting properties of both materials was pronounced. This is not new information as far as cresylic acid is concerned but, as far as is known, this is the first time such an application has been made with pinonic acid. No attempt was made to compare other similar glycols with butyl cellosolve.

The variations in wetting times for mixtures of pinonic and cresylic acids with butyl cellosolve containing 50 and 75 percent of the acids and a standard (a mixture of polyhydric alcohols and cresylate) with the amount of penetrant used are given in Table I and Figure 2. Since mixtures of pinonic acid and butyl cellosolve contain undissolved solids, the quantities added to the caustic solutions were measured by weight (grams). The other penetrants were liquids and were added by volume (milliliters).

The data plotted in Figure 3 represents tests using one gram or milliliter of penetrant for 100 milliliters of caustic solution while varying the caustic strength from 105 to 465 grams per liter. This variation is equivalent to varying the sodium hydroxide percentage from about nine to about 34. Those penetrants containing the high percentage of butyl cellosolve are effective over a wider range of caustic concentrations.

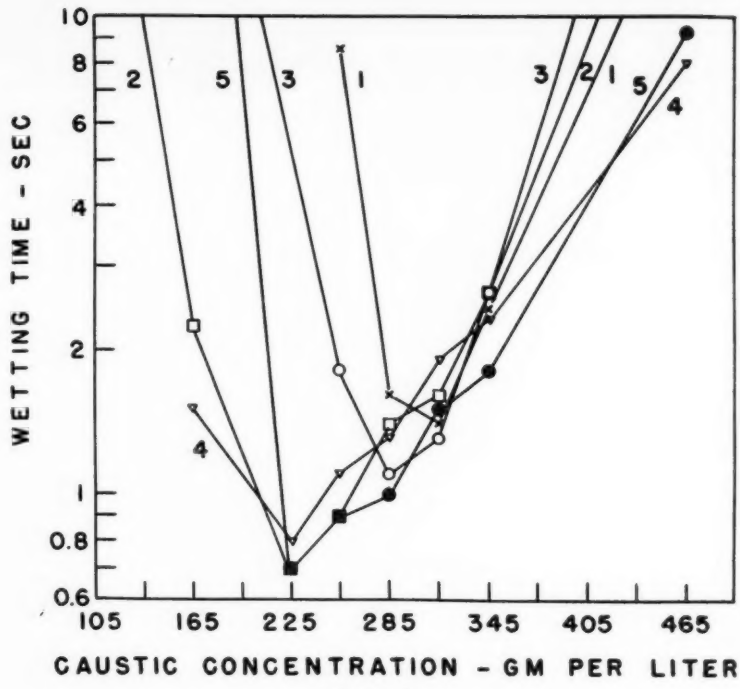


Figure 3
Wetting time vs caustic concentration. See Table I for penetrant compositions.

Temperature effects are shown in Figure 4, where one gram or milliliter of penetrant and temperatures of 26, 50 and 75°C were used. Those penetrants containing 50% pinonic acid and 50 and 75% cresylic acids do not seem to be effected by the increase in temperature; while the wetting times for the others increase rapidly as the temperature increases.

Pinonic acid, when mixed with butyl cellosolve, makes a very effective mercerizing penetrant and compares

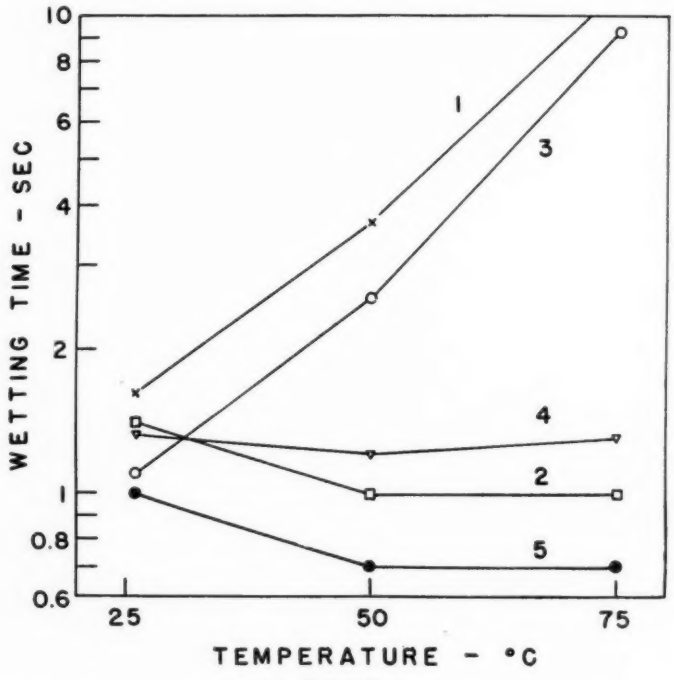


Figure 4
Wetting time vs temperature. See Table I for penetrant compositions.

TABLE I

Wetting of pinonic and cresylic acid-butyl cellosolve mixtures

Curve no.	Symbol	Composition	Wetting time (sec) Gm or ml penetrant for 100 ml caustic 1.25	1	0.85	0.5	0.25
1	×	standard	1.1	1.6	3.0	18.2	—
2	□	50% pinonic acid 50% butyl cellosolve	1.3	1.4	1.6	2.1	2.9
3	○	75% pinonic acid 25% butyl cellosolve	1.0	1.1	1.5	14.6	—
4	△	50% cresylic acids 50% butyl cellosolve	1.3	1.3	1.4	1.5	2.1
5	●	75% cresylic acids 25% butyl cellosolve	0.9	1.0	1.1	1.2	1.9

favorably with cresylic acid. Mixtures may be selected so that the wetting times of the penetrant are only slightly effected by variations in the amount used, caustic concentration and temperature.

LITERATURE CITED

(1) Fisher, G S, and Stinson, J S, *Ind Eng Chem* **47**, 1569-72 (1955).
(2) Delepine, M, *Bull soc chim France* **3**, (5) 1369-82 (1936).
(3) American Association of Textile Chemists and Colorists, "1957 Technical Manual and Year Book of the American Association of Textile Chemists and Colorists" **XXXIII**, p. 156, Howes Publishing Co, Inc, New York (1957).
(4) Loeblich, V M, Magne, F C, and Mod, R R, *Ind Eng Chem* **47**, 855-8 (1955).

Abstracts

The Application of Reactive Dyes to Viscose Rayon

Fowler, J A and Preston, C, *J Soc Dyers Col* **74**, 372-9, May, 1958.

Although it had been aimed at for many years, the target of a simple and commercially acceptable means of achieving the chemical linkage of a water-soluble dye to cellulose proved elusive until the discovery of the Procion dyes. The present paper is concerned with these dyes. Unless specifically stated otherwise, the term "*Procion dyes*" here refers to cold-dyeing Procion types and not to "H" brands.

Procion dyes are water-soluble and contain a reactive group capable of linking with cellulose, particularly under alkaline conditions. The structure of a Procion dye may be represented as S-R-X, where S represents one or more sulfonic-acid groups conferring solubility on the molecule, R the colored organic molecule, and X a reactive halogen atom. The reaction between Procion dye and cellulose may therefore be represented as follows—

$$\text{S-R-X} + \text{HO-Cellulose} \longrightarrow \text{S-R-O-Cellulose} + \text{HX}$$

Since the reaction takes place from aqueous solution, there is also a side-reaction with water, as follows—

$$\text{S-R-X} + \text{HOH} \longrightarrow \text{S-R-OH} + \text{HX}$$

The reaction with cellulose appears, however, to be surprisingly rapid compared with the side-reaction. This is the important feature of this new system of dyeing.

Reactive dyes of the Procion type offer a versatile dyeing system for producing dyeings of attractive color and good fastness to washing. A merit of the Procion system is that, since it is based on a simple chemical reaction with the fiber, it is capable of variation in easily controlled and readily understood ways common to many chemical reactions. The rate of this fixation reaction can be made to vary from slow at room temperature and mild alkalinity to rapid at high temperature or high alkalinity, intermediate rates being achieved at will by controlling various simple factors. Choice of method of dyeing is therefore wide and will depend largely on the particular equipment readily available.

The authors describe five different procedures for applying these cold-dyeing dyes to viscose rayon:

1) Batchwise dyeing
2) Pad (bicarbonate)-batch-wash off ("pad-roll" process)
3) Pad (bicarbonate)-dry-wash off
4) Pad (bicarbonate - urea) - dry-wash off
5) Pad (bicarbonate)-steam-wash off

The five dyeing methods, and the results obtained by each, are compared. The authors state that if urea is added to the padding liquor (method 4), an increased tinctorial yield can be obtained, particularly on cotton.

Dyeing Properties of Mature and Immature Cotton

Furvik, N-B, *J Soc Dyers Col* **74**, 299-303, April, 1958

It is well known that the degree of maturity of a cotton fiber has a great influence on many of its properties, both physical and chemical. As early as the nineteenth century, it was observed that thin-walled or immature cotton fibers dye differently from normal ones. This often makes it a hard and sometimes an impossible task to dye a piece of cotton fabric an even color if it holds a fairly large proportion of immature fibers. The greatest difficulties are encountered with a fabric containing neps, which consist mainly of immature fibers. However, if the fabric is mercerized before it is dyed, the color differences between the neps and the rest of the fabric will generally decrease.

The author refers to Goldthwait's "differential dyeing" method for determining the maturity of a cotton fiber, using a green and a red direct dye.

Laboratory dyeing experiments, carried out with direct dyes on immature and mature cotton fibers of known origin, are described. These showed that the maturity did not affect the amount of dye absorbed at equilibrium. The absorption and desorption rates, however, were higher for immature than for mature fibers. Mercerization of the fibers before dyeing did not greatly affect the differences.

The causes of why immature fibers in general and especially in neps look lighter in color than the rest of the fabric are discussed. A theory is put forward that, besides the effect of optical differences, the differences in depth are caused by the more rapid desorption of dye from immature fibers. Such differences would be exaggerated by unsuitable processing conditions, eg, during rinsing, which was confirmed by some laboratory dyeings on fabric samples.

From the results, it is predicted that, in order to obtain an even color on a fabric containing immature as well as mature fibers, dyeing should not be continued until equilibrium is reached, and that rinsing and after-treatments should be carried out so that the dye desorption will be as small as possible.

Thirteen references to the literature are cited.

A CONTRIBUTION TO THE DYEING OF WOOL WITH 2:1 METAL COMPLEX DYES*

H EGLI and E WALTHER
Sandoz Ltd
Basle, Switzerland

Although 2:1 metal complex dyes applied to wool from a neutral dyebath give very satisfactory colorfastness, the relatively high pH values (6.5-8) may result in fiber damage. Various procedures have been introduced in an effort to safeguard the fiber, at the same time utilizing the advantages to be gained by the application of these dyes. One of the most recently developed of these procedures is reported on with relevant data in connection with the recommended auxiliary products.

THE 2:1 metal complex dyes are highly satisfactory in meeting present-day requirements for fast wool colors. Their fastness properties approach those of afterchrome dyes, and they have the additional merits of simplicity of application and good level dyeing. This latter property is due 1) to their even rates of absorption, and 2) to the fact that they are not susceptible to differences in the origin and grade of the wool fibers and therefore do not dye skittery. These characteristics are dependent in turn on the correct choice of pH conditions, for although the 2:1 dye-metal complexes contain no sulfonic acid groups, they are of acidic character and are subject to laws similar to those applying to the neutral-dyeing acid milling colors. The lower the pH of the group, the higher the rate of dyeing and the poorer the intrinsically moderate migration properties. The optimum dyeing pH for this class therefore lies in the neutral region (pH 6.5-8.0). The question now arises whether the wool fiber is not adversely affected at these comparatively high pH values. This question has been given considerable study and the results all point to the same conclusion; namely, that in the isoelectric region of the wool, ie, at pH 4.8-5.0, it is least susceptible to chemical attack, while at neighboring values down to pH 2.0 and up to pH 7.0 the amount of fiber tendering is negligible. This applies only to measurable effects like tenacity and the acid and alkali solubilities, for where the handle and spinning properties of neutral-dyed wool are concerned, the general opinion is that they are inferior to those of wool dyed from weakly acid baths. Moreover, in the strictly neutral dyeing process there is always a possibility that the bath pH may shift to the alkaline region because of the residual alkali in the goods, and if this should happen there is serious danger of fiber tendering.

A number of dye manufacturers have sought to eliminate these uncertainty factors by developing dyeing assistants and methods which would permit the 2:1 metal complex dyes to be applied in the weakly acid pH region. The first auxiliaries of this type were the nonionic compounds Avolan IW (Bayer), Uniperol W (BASF) and Cibalan Salt S (Ciba). Another dyeing assistant of this group is Lyogen SMK, marketed by Sandoz.

These products possess affinity for dyes, by virtue of which the rate of dyeing is made largely independent of the bath pH, and at the same time they exert very marked level dyeing action upon the dye. An addition of Glauber's salt enhances level dyeing in their presence, while in the neutral-dyeing method they have no effect on dyeing. The reason for this is that the amino groups of the wool accumulate hydrogen ions in the acid pH region, giving the fiber a positive charge and thereby causing it to attract the negatively charged dye ions. If negatively charged sulfate ions are also present, these relatively small anions, owing to their greater mobility, will occupy the dye sites before the heavier and slower dye anions. The retarding and leveling action of the sulfate ions is due to the fact that these small anions are only slowly displaced from the fiber by the much larger dye anions. This slow exchange of anions contributes to level dyeing. By contrast, no electrostatic attraction of dye can take place in the neutral-dyeing method since the wool does not carry a positive charge; consequently Glauber's salt has no effect on level dyeing.

Experience has shown that it is advisable to buffer the acetic acid dyebath with sodium acetate, as the bath is then self-adjusting to the optimum pH of 4.8—5.0. It is, of course, possible to set the bath with acetic acid alone with the aid of a pH meter.

On the basis of these theoretical considerations, supported by practical experience, the following dyeing method has been formulated by Sandoz:

After thorough wetting out of the goods, set the dyebath at 50-60°C (122-140°F) and add, in the following order:

1.5 to 3% owf Lyogen SMK
3% owf sodium acetate
2 to 3% owf acetic acid 80%
3.0 g/l Glauber's salt calc.

Enter the goods, and, after a short run in the blind bath, add the dye solution. Bring the bath to the boil in 45 minutes and boil for 45 minutes, then take a sample. Add shading color with the steam turned off, ie, at 85-90°C (185-194°F); shading at this temperature is made possible by the retarding action of Lyogen SMK. This property of Lyogen SMK also makes it valuable for correcting unlevel shades of 2:1 metal complex dyes by treatment in a fresh bath at the boil.

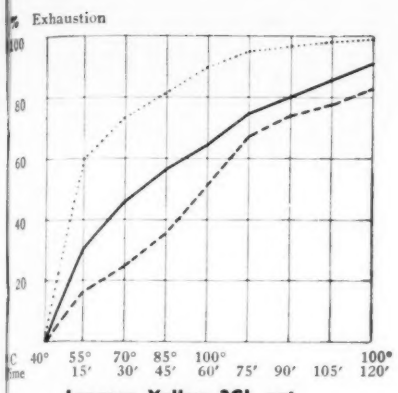
The time/temperature curves (Figure 1) show the effect of Lyogen SMK on the dyeing behavior of the Lanasyn* colors, a range belonging to the 2:1 metal complex class of dyes. It can be seen that, in the acid pH region, the retarding action of the assistant confers better dyeing characteristics on these dyes than they show in the conventional neutral method without assistant. The curves are linear and far less steep during the heating period, so that level dyeing can be expected from the initial strike onwards. On comparing the curves it will be noticed that the baths containing Lyogen SMK are not completely exhausted. This shift in the dyeing equilibrium brings

*Registered trademark of Sandoz, Inc.

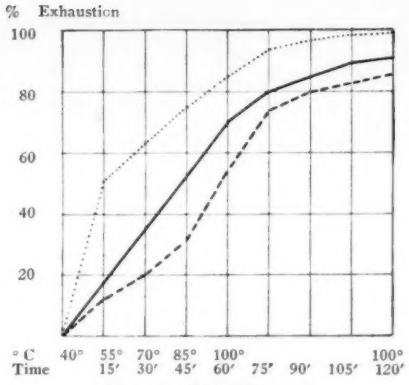
Figure 1

Key to Dyeing Curves:
..... 3.0% ammonium sulfate
- - - - - - - - - 2.0% Lyogen SMK
3.0% ammonium sulfate
——— 2.0% Lyogen SMK
3.0% sodium acetate
2.5% acetic acid 80%
3.0 g/l Glauber's salt calc

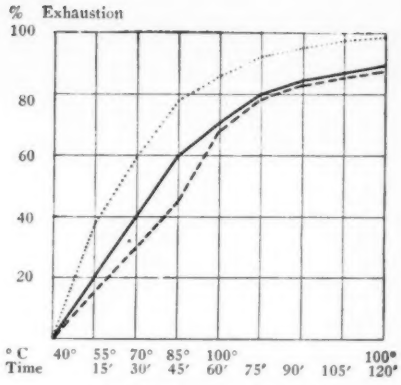
*Orginally published in the "Deutscher Faerberkalender".



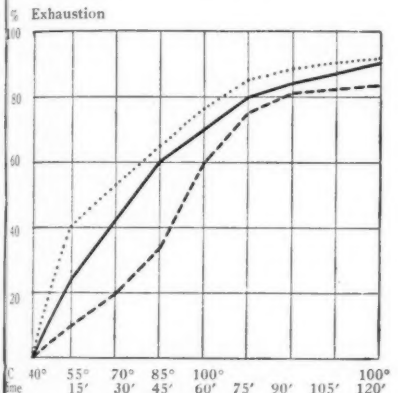
Lanasyn Yellow 3GL pat



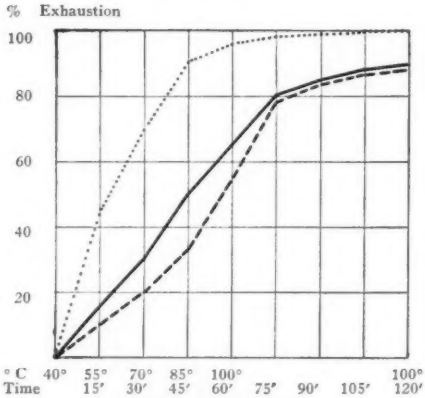
Lanasyn Red 2GL pat



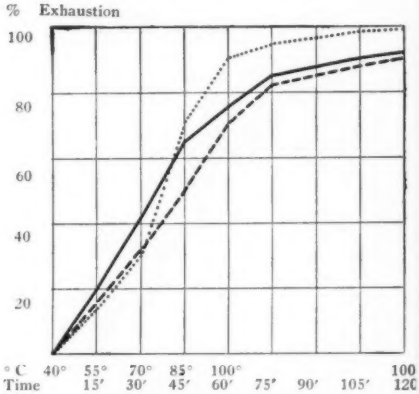
Lanasyn Brown 3RL paf



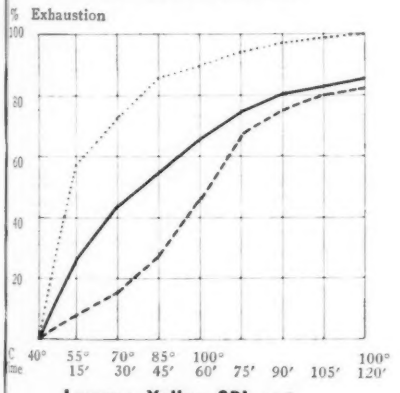
Lanasyn Yellow GLN pat



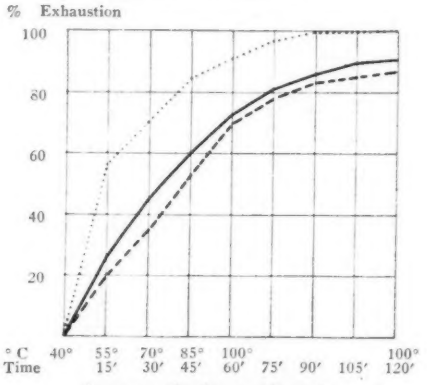
Lanasyn Red BL paf



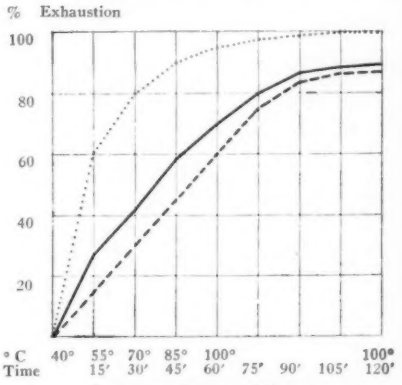
Lanasyn Brown RL paf



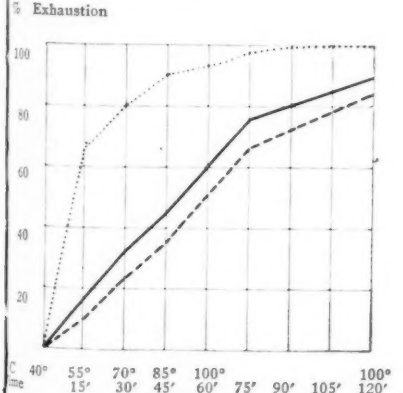
Lanasyn Yellow 2RL pat



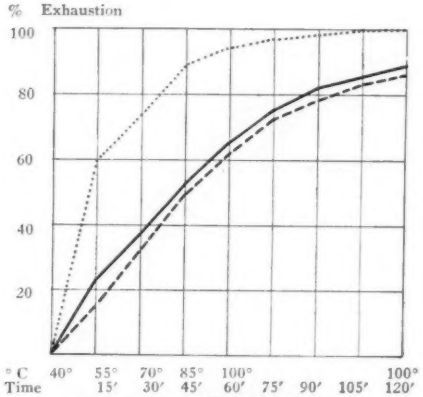
Lanasyn Bordeaux RL pat



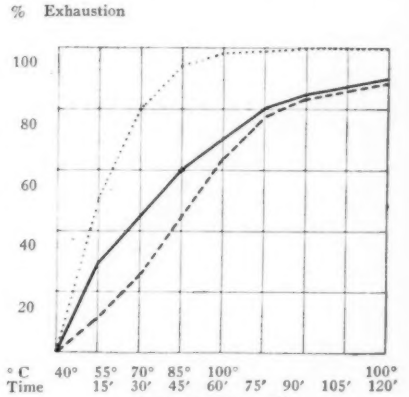
Lanasyn Brown GRL pat



Lanasyn Orange RLN paf



Lanasyn Dark Violet RL pat



Lanasyn Grey BL

about a great improvement in the migration of the Lanasyn dyes.

In the method employing ammonium salts without other assistants, the dyebaths are almost completely exhausted and the exchange of dye between fiber and liquor, upon which migration depends, is very limited. In the acid dyebath containing Lyogen SMK and Glauber's salt, about 10% of the initially applied dye remains in the boiling bath, which provides for adequate exchange of dye and leads to remarkably good migration.

The effect of Lyogen SMK is also illustrated by cross-sections of dyed fibers (Figure 2). The upper photomicrograph shows the cross-section of wool yarn dyed with 2.0% Lanasyn Red BL at pH 4.8 without assistant. The rate of dyeing was very rapid and the yarn is skittery, as would be expected under these conditions, the different fibers having different depths of shade. The lower photomicrograph shows the cross-section of wool yarn dyed under the same pH conditions but with an addition of 2.0% Lyogen SMK; in this case the single fibers are dyed to uniform depth, indicating that excellent level dyeing has been obtained.

Dyehouse trials have demonstrated that slubbing, hanks, cheeses and piece goods can be dyed to excellent level shades by this method. Wherever the weakly acid dyeing process has been adopted, it has proved highly satisfactory, in piece dyeing as in other fields. Short dyeing times, good level dyeing, simple and safe shading in the hot bath, high light- and wet-fastness, brighter shades and maximum protection of the physical properties and appearance of the wool—these are the many advantages of the acid dyeing method.

A few comments on suitable brightening and shading colors are called for to complete this discussion of wool dyeing with 2:1 metal complex dyes. For the acid dyeing method, the 2:1 metal complex dyes should be given preference for shading purposes; where necessary they can be supplemented by acid dyes, such as the Xylene Fast "P" colors, which are also used for shading mordant acid dyeings. When neutral-dyeing milling colors are chosen for shading 2:1 metal complex dyeings, the acid dyeing method is not so satisfactory because nonionic compounds such as Lyogen SMK do not exercise sufficiently strong retarding action on these dyes in the acid pH region. In such cases it is advisable to dye with an addition of ammonium sulfate. The leveling action of Lyogen SMK is not limited to the acid pH region, being equally evident in ammonium sulfate baths. The time/temperature dyeing curves of Lanasyn dyes applied with ammonium sulfate and Lyogen SMK show a high degree of coincidence with those plotted from acetic acid baths. In the presence of ammonium sulfate, the brightening colors level equally as well as the 2:1 metal complex dyes and, like the latter, show improved migration. However, it is important to ensure that the initial pH of ammonium sulfate baths does not exceed 7.0 for the reason mentioned in the opening paragraph above. During dyeing, the ammonium sulfate is hydrolyzed to give:

$$(NH_4)_2SO_4 + 2H_2O \rightleftarrows 2NH_4OH + H_2SO_4$$

The ammonia so formed escapes and the sulfuric acid enters into chemical combination with the wool. No damage to the fiber properties results from this, however, as the combined sulfuric acid gives the fiber an "internal pH," which lies below that of the dyebath.

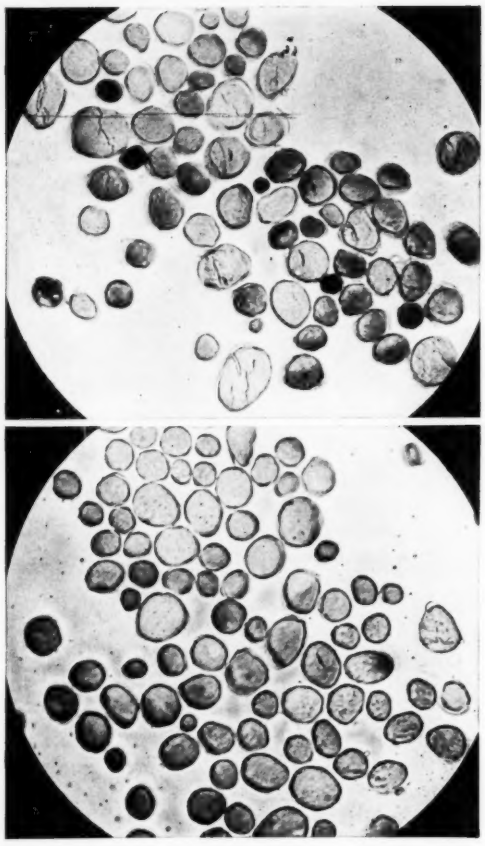


Figure 2
Cross-Sections of Wool Yarn
(Magnification: 230X)

Upper Photomicrograph
2.0% Lanasyn Red BL paf dyed with
15.0% Glauber's salt calc
3.0% sodium acetate
2.5% acetic acid 80%

Lower Photomicrograph
2.0% Lanasyn Red BL paf dyed with
15.0% Glauber's salt calc
3.0% sodium acetate
2.5% acetic acid 80%
2.0% Lyogen SMK

DYEING CURVES OF LANASYN DYES —— The time/temperature dyeing curves were plotted by dyeing with the Lanasyn dyes in standard depth at a bath ratio of 50:1. Dyeing was started at 40°C (104°F) and the temperature increased at the rate of 1°C per minute. Every 15 minutes a sample of the dyebath was taken and the dye content colorimetrically determined. These values were plotted against the corresponding temperatures and joined by straight lines to give the complete curve.

Proceedings of the

American Association of Textile Chemists and Colorists

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August 25, 1958

NOMINATION NOTICE

The National Councilors representing Sections, in their capacity as Nominating Committee, have nominated George O Linberg as candidate for president for the year 1959. The nomination of any other Senior member, signed by fifty or more Senior members, may be filed with the secretary of the Nominating Committee not later than October first and will be given equal standing on the ballot.

The members of the Northern New England, Rhode Island, and Western New England Sections will elect a vice president for the New England Region. The National Councilors from this Region have nominated J Edward Lynn and W George Parks.

The members of the Delaware Valley, Hudson Mohawk, Niagara Frontier, and Metropolitan Sections will elect a vice president for the Central Atlantic Region. The National Councilors from this Region have nominated Bernard K Easton and Weldon G Helmus.

GEORGE O LINBERG

The members of the Piedmont, South Central, Southeastern, and Washington Sections will elect a vice president for the Southern Region. The National Councilors from this Region have nominated H Gillespie Smith.

The members of the Mid-West, Pacific Northwest and Pacific Southwest Sections will elect a vice president from the Western Region. The National Councilors from this Region have nominated Elliott Morrill.

A nomination for vice president from any Region signed by twenty-five or more members of that Region may be filed with the secretary of the Nominating Committee not later than October first and on the ballot will receive equal standing with other nominations for that office.

J EDWARD LYNN

W GEORGE PARKS

BERNARD K EASTON

WELDON G HELMUS

H GILLESPIE SMITH

ELLIOTT MORRILL

Committee on Wash and Wear ———

WASH AND WEAR FABRICS— APPEARANCE AFTER HOME LAUNDERING

Tentative Test Method 88-1958

With the advent of Wash and Wear fabrics on the market about three years ago, the need for an official test method was foreseen by the AATCC Technical Committee on Research (TCR). The organizational meeting of the AATCC Committee on Wash and Wear was held on September 23, 1955 during the Annual Meeting in Atlantic City. The Committee decided that a test method should be set up by which to evaluate wash and wear properties in order that the term "wash and wear" might have uniform meaning in the industry. For over two years the Committee has been actively engaged in developing a test method to measure the appearance or freedom from wrinkles of textile fabrics after washing and drying.

Considerable study has been made of the influence of such factors as laundering temperatures, type of mechanical agitation in laundering, size of the load used in home washers, laundering time, rate of spin drying, methods of drying, etc, on the wrinkling of various types of fabrics. Much attention has also been given to the development of methods for grading wash and wear fabrics after laundering.

After a considerable amount of comprehensive study by several subcommittees and a successful series of inter-laboratory tests, the present test was proposed at the May 22, 1958 meeting of the TCR. This was approved as a tentative test method through letter ballot by TCR in June, 1958.

COMMITTEE

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G W WERNZ
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G H WOOD

The Committee wishes to thank the laboratories which so kindly participated in the evaluation of the proposed methods leading to the development of this test method. The participating laboratories were as follows:

American Viscose Corp
Joseph Bancroft & Sons, Inc
Celanese Corp of America
The Chemstrand Corp
Cranston Print Works Co
Dan River Mills, Inc
E I duPont de Nemours & Co, Inc
Florida State Univ
D B Fuller & Co
Good Housekeeping Institute
Monsanto Chemical Co
J C Penney Co, Inc
Rohm & Haas Co
Sayles Finishing Plants, Inc
Sears, Roebuck & Co
Spring Mills
J P Stevens & Co, Inc
U S Testing Co, Inc

The Committee would like also to thank all the people who participated in the preparation of the method and interpretation of the data.

PURPOSE AND SCOPE———This method is intended for evaluating only the smooth appearance of Wash and Wear fabrics after repeated home laundering.

PRINCIPLE———Fabric specimens are subjected to procedures simulating home laundering practices. Two alternate washing temperatures and three alternate drying procedures (drip, tumble, and line) are offered. In addition, a hand washing procedure using drip drying is included. Specimens are evaluated under standardized lighting conditions and assigned numerical ratings based on their similarity to standard photographs.

APPARATUS AND MATERIALS ———Automatic washing machine having:

1) Controlled wash water temperature settings of 105 and 140°F (41 and 60°C) with rinse water temperature of 105 ±5°F (41 ±3°C).
2) Normal agitator speed no slower than 47 cycles/min.
3) Final spin speed (range 480-660 rpm).
4) Final spin cycle time of four to six minutes.

Automatic tumble dryer having:

1) Controlled exhaust temperature which cycles to 160°F (71°C) but not exceeding it.
2) A cooling period while tumbling of five to 10 min at the end of the drying cycle.

A steam or dry iron with appropriate fabric temperature settings.

A lighting and evaluation area in a darkened room using a lighting and viewing arrangement as shown in Figure B (*1*).

Drip and line drying facilities.

Soap or synthetic detergent.

Standard photographs (*2*) numbered 1 through 5, as shown in Figure A.

Dummy load of 3′ x 3′ hemmed pieces of type 128 cotton sheeting which, when added to test specimens, will make a four-pound load.

A 10-quart pail.

TEST SPECIMENS———Prepare three test specimens (*3*) each 15″ x 15″ cut parallel to the warp and filling, pinked to prevent fraying (*4*) and marked to indicate the direction of the warp.

TABLE I

Test No.	*Method*	*Wash water temperature °F*	*°C*	*Drying method*
1	hand	105	41	drip
2	machine	105	41	drip
3	machine	105	41	tumble
4	machine	105	41	line
2a	machine	140	60	drip
3a	machine	140	60	tumble
4a	machine	140	60	line

PROCEDURES———

1) *Hand Wash-Drip Dry* (*5*)

Dissolve 20 gms of neutral soap or detergent in two gallons of water at 105°F (41°C) in a 10-quart pail and then add three test specimens. Wash for a total of five minutes lightly

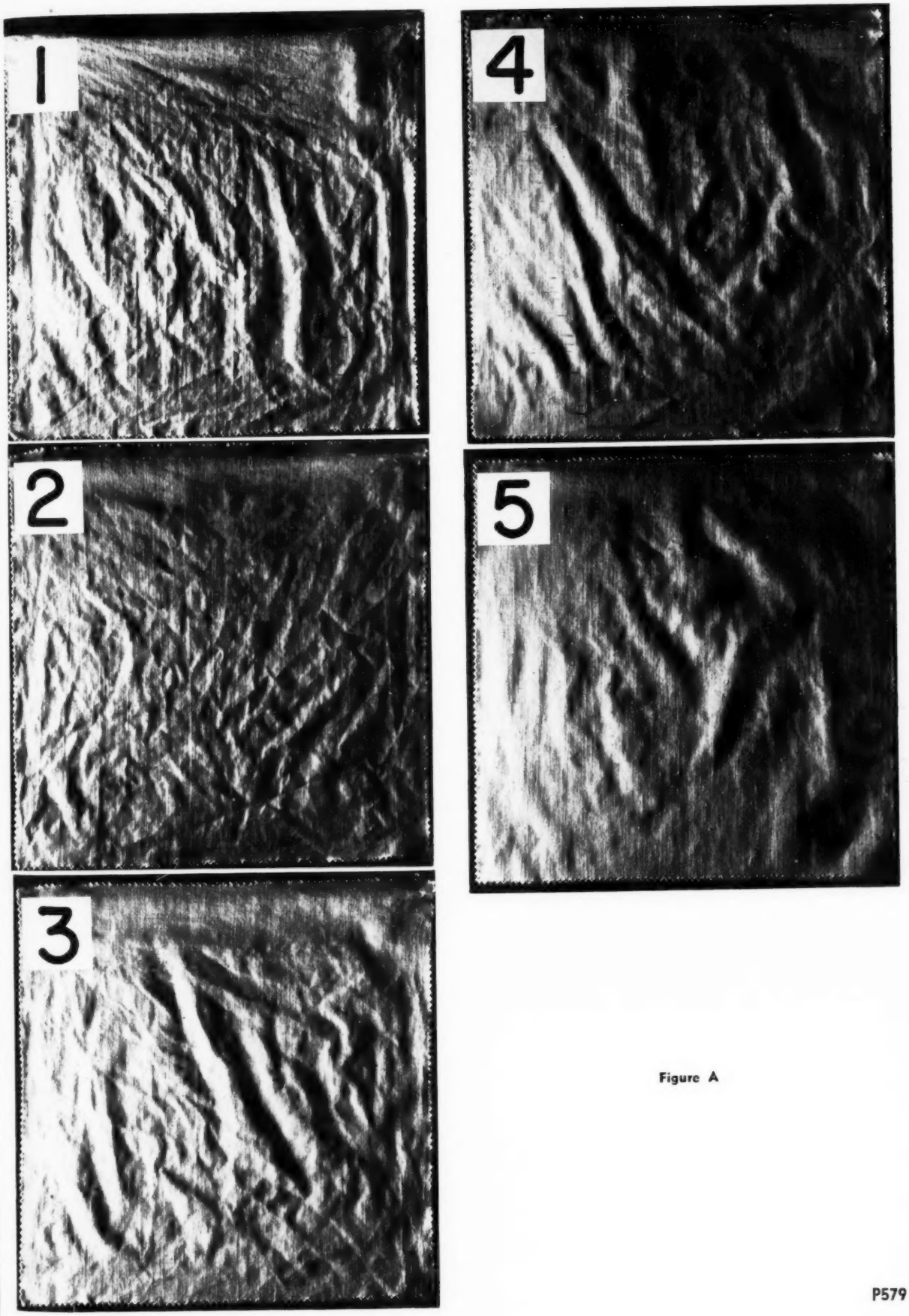

Figure A

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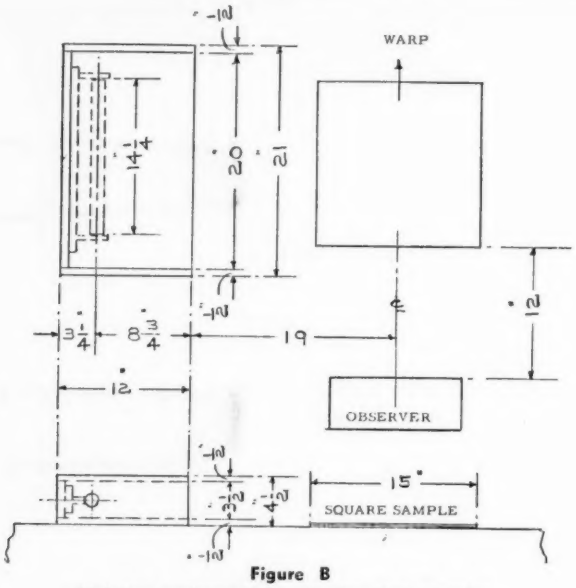

Figure B
Lighting equipment for viewing test samples

Materials List

1—Fluorescent light fixture #12-15, General Electric Co or Progress Mfg Co
1—14-watt cool white fluorescent light
1—Six-ft #18-2 lamp cord
1—Electric plug
1—Feed through switch
2—#1 Marr connectors
½" x 12" clear finish white pine
½" x 5" clear finish white pine
18—One-inch #6 screws
Outside finish for box—two coats orange shellac
Inside finish—none

(Source, Cranston Print Works Co, Cranston, RI)

scrubbing the center portion of each test piece separately for a period of one minute. Rinse twice for two minutes with no twisting or wringing using two gallons of water at 105°F (41°C). Remove the test specimens and hang each by two corners with the warp in the vertical position in still air at room temperature until dry. Repeat the washing and drying procedure four times. After the final drying, condition by hanging each specimen by two corners with the warp in a vertical position in still air for two hours at 70°±2°F (21 ±1°C), 65 ±2% rh and then evaluate.

2) *Machine Wash—Drip Dry.*
Test 2 — 105 ±5°F (41 ±3°C)
Test 2a — 140 ±5°F (60 ±3°C)

Use the full water level of the washer for either Test 2 or Test 2a. Add the test specimens and enough dummy pieces to make a four-pound load using no less than 10 dummy pieces. Add neutral soap or detergent in sufficient quantity to produce a good running suds.

Set washer for a 10-minute washing time. Allow washing to proceed automatically up to the final deep rinse cycle. *Just before the water begins to drain for the final spin dry cycle,* remove the test specimens and hang each by two corners with the warp in the vertical position in still air at room temperature until dry. Repeat the washing and drying procedure four times. After the final drying, condition by hanging each specimen by two corners with the warp in a vertical position in still air for two hours at 70 ±2°F (21 ±1°C), 65 ±2% rh and then evaluate.

3) *Machine Wash—Tumble Dry.*
Test 3 — 105 ±5°F (41 ±3°C)
Test 3a — 140 ±5°F (60 ±3°C)

Use full water level of the washer for either Test 3 or Test 3a. Add the test specimens and enough dummy pieces to make a four-pound load using no less than 10 dummy pieces. Add neutral soap or detergent in sufficient quantity to produce a good running suds. Set washer for a 10-minute washing time. *Allow washing to proceed automatically through the entire cycle.* Immediately at the end of the final spin dry cycle, separate tangled pieces and place the washed load (test specimens and dummy pieces) in the tumble dryer and dry. Remove the load immediately after the dryer stops. Repeat the washing and drying procedure four times. After the final drying, condition by hanging each specimen by two corners with the warp in a vertical position in still air for two hours at 70 ±2°F (21 ±1°C), 65 ±2% rh and then evaluate.

4) *Machine Wash—Line Dry.*
Test 4 — 105 ±5°F (41 ±3°C)
Test 4a — 140 ±5°F (60 ±3°C)

Use full water level of the washer for either Test 4 or Test 4a. Add the test specimens and enough dummy pieces to make a four-pound load using no less than 10 dummy pieces. Add neutral soap or detergent in sufficient quantity to produce a good running suds. Set washer for a 10-minute washing time. *Allow washing to proceed through the final spin cycle.* Remove the test specimens immediately and hang each by two corners in still air until dry. Repeat the washing and drying procedure four times. After the final drying, condition by hanging each specimen by two corners with the warp in a vertical position in still air for two hours at 70 ±2°F (21 ±1°C), 65 ±2% rh and then evaluate.

EVALUATION———The test specimen should be placed flat on a table in the manner shown in Figure B. Three trained observers should rate each test specimen independently using the specified lighting conditions. Assign the photograph number which most nearly matches the appearance of the test specimen. Class 5 is equivalent to Photograph 5 and represents the *best wrinkle resistance,* while Class 1 is equivalent to Photograph 1 and represents the *least wrinkle resistance.*

Class 5—negligible or no change as shown in Photograph 5.

Class 4—a change in appearance equivalent to Photograph 4.

Class 3—a change in appearance equivalent to Photograph 3.

Class 2—a change in appearance equivalent to Photograph 2.

Class 1—a change in appearance equivalent to Photograph 1.

CALCULATION AND REPORTING RESULTS———Average the nine observations made on each test fabric (three judgments on each of three specimens). Report the average to the nearest decimal and indicate the procedure used (Test 1, 2, 2a, 3, 3a, 4, or 4a).

NOTES———

(1) Source, Cranston Print Works Co, Cranston, Rhode Island.

(2) Source, Monsanto Chemical Co, Springfield 2, Massachusetts.

(3) Wrinkles in test specimen should be removed by appropriate ironing prior to testing.

(4) If excessive fraying occurs, specimens should be stitched loosely.

(5) Like other hand wash procedures the procedure in Test No. 1 has inherent limitations (eg, limited reproducibility of the type of action involved due to the human element).

36th Annual Convention———

THE MECHANISM OF DYEING ORLON 42 ACRYLIC FIBER*

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Bound Brook, NJ

The theory that Orlon 42 is dyed on specific anionic sites by cationic dyes is supported by the results of equilibrium dyeing studies. The relative affinity measurements showed that previously available dyes have very high affinity for Orlon 42. This results in poor leveling properties, in agreement with the behavior of other classes of dye on other fibers. However, these high affinities are also associated with poor rates of exhaustion, and microscopical cross-sections show incomplete penetration of the dye into the fiber.

A new class of cationic dyes, which have lower affinity and give level dyeings on Orlon 42, has also been studied. Dyeing rate curves indicate excellent rates of exhaustion and rapid attainment of equilibrium. Microscopical cross-sections show complete penetration within normal dyeing times. Lightfastness ratings are 80 hours or better.

INTRODUCTION

VERY little fundamental information concerning the mechanism involved in dyeing Orlon 42 acrylic fiber with cationic dyestuffs has been found in the literature. Recently a series of papers by Glenz and Beckmann was published in *Melliand Textilberichte* (*1*) in which the authors presented their theory as to the mechanism involved in dyeing Dralon and PAN, two acrylic fibers of German manufacture. They found, through a thermodynamic study of the dyeing operation, that both fibers are dyed on specific anionic sites. They also found the saturation value of both to be 37 millimoles of dye per kilogram of fiber.

It was felt that a thermodynamic study into the mechanism by which Orlon 42 is dyed with cationic dyes would aid us in understanding more clearly the problems experienced by the dyer when he applies the commercially available cationic dyes to Orlon 42 fiber. This study is supplemented by dyeing rate determinations and microscopical examinations of the dyed fiber.

A new series of cationic dyes for Orlon 42 is also discussed.

MILL PROBLEMS———Levelness and an efficient stripping technique are two major mill problems.

When the dyer uses commercially available cationic dyes on Orlon 42, he finds it virtually impossible to produce a level dyeing unless he uses a retarding agent or very fine temperature control. This is because the cationic dyes now available strike very rapidly and do not show good penetration into the fiber at temperatures up to 212°F within three hours.

Since most mills do not have the proper equipment, temperature control becomes a time-consuming and tedious operation. The dyer must, therefore, resort to the use of cationic retarding agents. Their function is to supply the dyebath with cations which compete with the dyestuff for the available anionic sites on the fiber. A slower dyeing rate is obtained which permits the dye to cover the surface of the fiber more evenly. In medium to heavy shades where retarding agents are employed, the amount of dye that can be exhausted onto the fiber is reduced, since the retarder itself occupies some of the anionic dye sites.

It has been found that the leveling problem is even more acute with the new, more dyeable Orlon 42. The dyer must use a greater quantity of cationic retarder with the new Orlon 42 than he did with the old fiber. By doing this, he again cuts the dye capacity of the fiber. The cost of this retarder is, in some cases, almost as high as the cost of the dye.

The stripping problem is also of major importance. An acceptable stripping technique is still not available to the dyer. The best technique available is one in which Textone (sodium chlorite 75-77%) and nitric acid are used to decompose the cationic dyestuff. This technique cannot be used easily on uneven lots or in cases where the fabric has been overdyed five to 10%, since it is very difficult to control the amount of dye removed by these chemicals. Furthermore, Textone and nitric acid seriously damage the wool in Orlon-wool unions. To partially strip the overdyed lot, cationic retarding agents plus salt have given the only commercially satisfactory results.

Still another problem is lightfastness. When dyeing blues and reds in pastel shades, the dyer finds it very difficult to obtain more than 40 hours lightfastness. There is, however, a need for dyes which possess greater fastness, such as for use in awnings, automobile tops and other fabrics which are exposed to direct sunlight for long periods of time.

EXPERIMENTAL AND DISCUSSION

We have studied the behavior of several cationic dyes, both the commercially available types and some new research types. Most of our dyeing studies were made on the old Orlon 42 fiber. The dyeing mechanism of the new, more dyeable Orlon 42 was also determined and found to be similar.

EQUILIBRIUM STUDIES———To begin with, we consider the equilibrium between the dye on the fiber and the dye in the dyebath. When a dyeing is run for a long period of time, a point is eventually reached at which no more dye is adsorbed by the fiber, and a true equilibrium is attained. All equilibrium data discussed were obtained at pH 4 under reflux (close to 100°C). The bath ratio was 80/1. Three cationic dyes were used: Methyl Violet, Malachite Green and Calcozine Acrylic Violet.

Figure 1 shows a plot of the reciprocal of the concentration of dye in the fiber against the reciprocal of the concentration of dye in solution. Each point represents one equilibrium dyeing. The fact that the plots of all three dyes approximate straight lines which extrapolate to the same point indicates that these plots represent Langmuir isotherms, and that dyeing occurs on specific acid sites in the Orlon 42 fiber.

The point on the horizontal axis to which the Langmuir isotherms extrapolate is the reciprocal of the saturation value for the dye on Orlon 42, since it indicates how much dye would go on the fiber at infinite dyebath concentration. The saturation value so obtained is about 31-32 millimoles of dye per kilogram of fiber. This figure is very close to that found by Glenz and Beckmann in their study of

* Presented at the 36th Annual Convention in Boston on November 16, 1957.
[1] Presently with Dan River Mills, Inc.

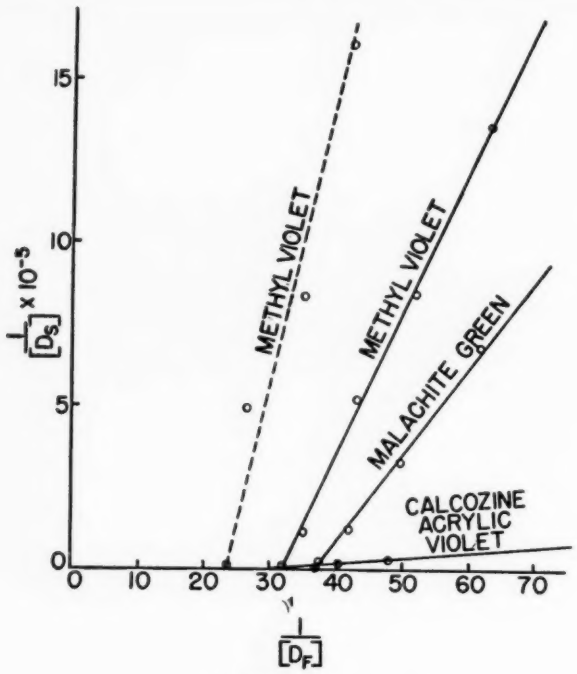

Figure 1
Langmuir adsorption isotherms

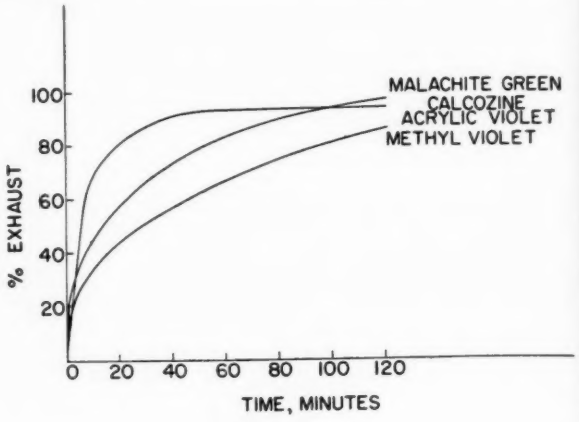

Figure 2
Dyeing rate curves

Dralon and PAN acrylic fibers *(1)*. Assuming the molecular weight of the original Orlon 42 to be 75,000, we find that this saturation value corresponds to two dye sites per mole of Orlon 42 fiber. It is felt that these sites are sulfate or sulfonate groups either at the ends of the polymer chain or built into it. Analysis of the fiber by both microchemical and X-ray fluorescence techniques indicates the presence of approximately 0.09% sulfur, which corresponds to the calculated amount of sulfate or sulfonate end groups obtained from the saturation value. From this value it can also be calculated that approximately five percent of commercial dye owf would be needed to saturate the fiber.

The new Orlon 42 merge dyes by the same dyeing mechanism as does the original fiber, the only difference being the magnitude of the saturation value. Equilibrium data obtained with Methyl Violet (Figure 1, dash line) indicate a saturation value of about 43 millimoles per kg of new Orlon 42 fiber, representing about a 40% increase in dyeability for the new fiber. This figure is in agreement with that of the Du Pont Company as stated in its technical bulletin *(2)*.

RELATIVE AFFINITY — The term relative affinity in this discussion is used in a thermodynamic sense. The term is related to the amount of dye in the fiber relative to the amount of dye in solution at equilibrium. Relative affinity as discussed in this paper is in no way related to the term used by the practical dyer to describe strike and exhaustion rate.

The data plotted in Figure 1 indicate that of the dyes studied, the one with the highest relative affinity is Methyl Violet; Malachite Green has an intermediate relative affinity, and Calcozine Acrylic Violet possesses the lowest relative affinity of the three dyes shown.

DYEING RATE STUDIES AND MICROSCOPICAL EXAMINATIONS——The dyeing rates of the three dyes previously discussed were run in order to determine if a relationship exists between the affinity of a dye and its dyeing rate. These rates were run in the "Dyeometer," an instrument designed to determine the exhaustion of a dye spectrophotometrically at any time during the dyeing operation *(3)*. The dyeings were run at pH 4 for two hours using 0.5% of real dye on the weight of the fiber. The liquor ratio was 80/1, and the bath temperature was 97°C. No retarding agent was used in these experiments. Results are shown in Figure 2. Calcozine Acrylic Violet, lowest in affinity, shows the most rapid attainment of equilibrium (reached in about 45 minutes); Malachite Green the dye with the intermediate affinity, has almost reached equilibrium after two hours; and Methyl Violet, the dye with the highest affinity, is still exhausting rather slowly after two hours.

Cross sections of the three dyeings after two hours time are shown in Figures 3, 4 and 5. Methyl Violet is seen to be narrowly ring dyed, Malachite Green diffusely ring dyed, and Calcozine Acrylic Violet completely penetrated.

From these results it is evident that Calcozine Acrylic Violet, the dye with the lowest affinity, gives the best penetration of the three dyes shown. The fiber is completely penetrated in a very short period of time.

Figure 6 shows the dyeing rates of four more cationic dyes. Two are representative of the cationic dyes available on the market today, while the other two represent the dyeing rates of two more of our new Calcozine Acrylic colors. Calcozine Acrylic Orange and Calcozine Acrylic Red show the same rapid attainment of equilibrium as is the case with Calcozine Acrylic Violet. This is made evident by the rapid leveling off of their dyeing rate curves. The equilibrium exhaustion value of 66% for Calcozine Acrylic Orange on the original Orlon 42 is increased to a value of 85% on the new merge. Cationic Dye A and Cationic Dye B, two cationic dyes available on the market today, take much longer to attain equilibrium.

Cross sections of the Calcozine Acrylic Red and the Calcozine Acrylic Orange dyeings show complete penetration. Figure 7, which shows a cross section of the Calcozine Acrylic Red dyeing, illustrates this. On the other hand, Figures 8 and 9 (cross sections of dyeings with Cationic Dyes A and

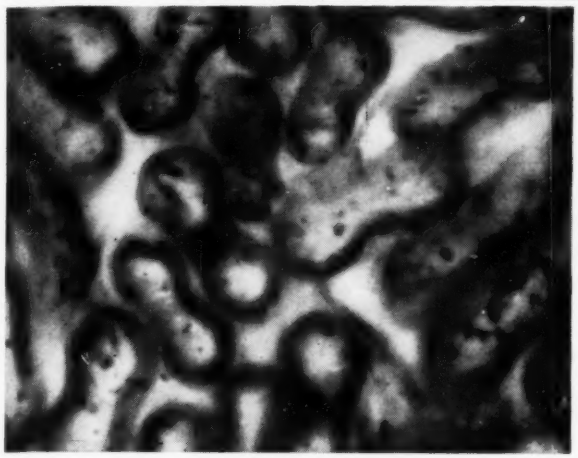

Figure 3
Cross section of Methyl Violet dyeing

Figure 4
Cross section of Malachite Green dyeing

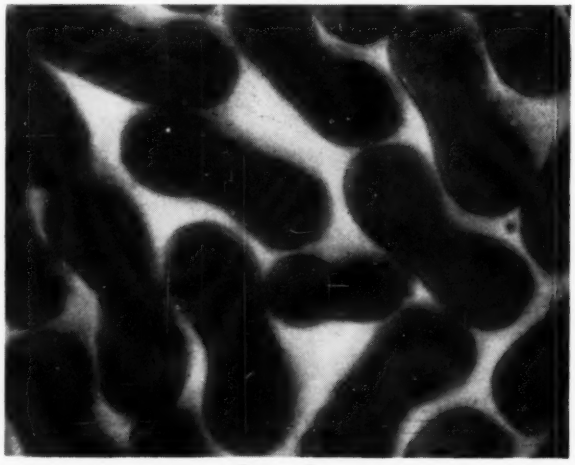

Figure 5
Cross section of Calcozine Acrylic Violet dyeing

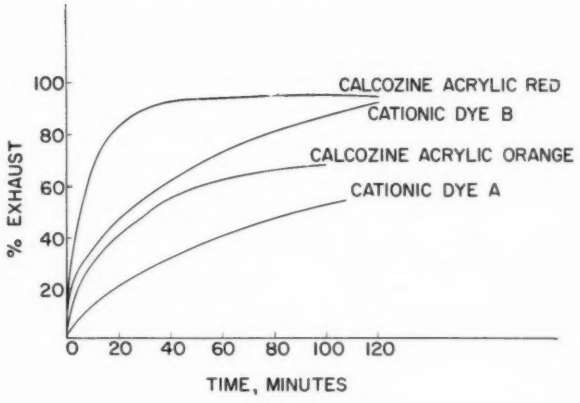

Figure 6
Dyeing rate curves

B, respectively) show narrow ring dyeings in both cases.

The Calcozine Acrylic dyes discussed in this paper are three of a new level dyeing series of cationic dyes which will be marketed by American Cyanamid Co in the near future. It is obvious that these Calcozine Acrylic dyes possess qualities which lead to level dyeing of Orlon 42 in much shorter dyeing cycles than now employed in the mill to dye the existing cationic dyes on Orlon 42 fiber. Good levelness is obtained without the necessity of using cationic retarders in the dyebath.

THEORY

Based on the previously discussed results, the mechanism of dyeing Orlon 42 with cationic dyes seems quite clear. Orlon 42 has a limited capacity for cationic dye, since only 31-32 millimoles of dye per kilogram of fiber can go on at saturation. Affinity, therefore, is most important in the dyeing process, since it is the major factor which affects diffusion and migration of the dye molecule.

A consideration of the mechanism by which a very high and a very low affinity dye are absorbed by a fiber will help clarify this discussion.

The high affinity dye strikes rapidly on the surface of the fiber and is held to the surface sites very tenaciously. A narrow ring of dyed fiber is produced in which all of the available sites are saturated with dye. The dye liquor leaving the outer-most ring and penetrating deeper into the fiber has been almost depleted of dye, and there is little dye left to work on the next portion of fiber. The next portion of the fiber will have to wait for the dye to leave the surface sites and penetrate into the fiber, and also for a new charge of dye solution to travel in from the bath. When the new charge strikes the portion of the fiber adjacent to the outermost portion, it again strikes hard and is once more almost entirely depleted of dye. Therefore, there is a rapid initial strike onto the surface sites followed by a very slow diffusion into the fiber. The rate of exhaust also is relatively slow.

The picture with a low affinity dye is similar but differs in degree. Only a limited number of the available sites on the outermost ring of the fiber are dyed. This is due to low equilibrium exhaustion on the surface sites. The dye liquor traveling toward the center of the fiber retains much more dye in solution than is the case with the high affinity dye. Also, the outermost portion of the fiber releases its dye much more readily. Therefore, dyeing of the next portion of the fiber occurs more rapidly. This results in a much faster

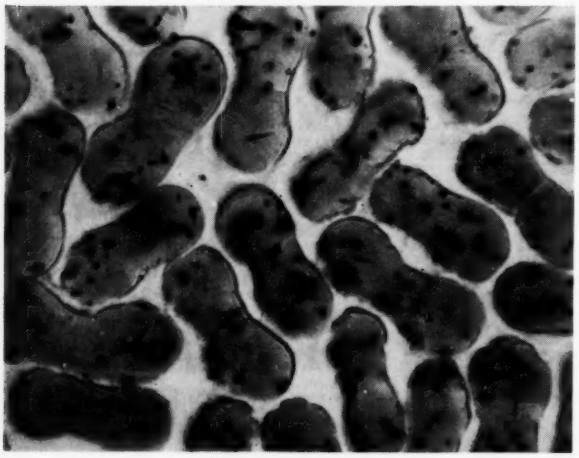

Figure 7
Cross section of Calcozine Acrylic Red dyeing

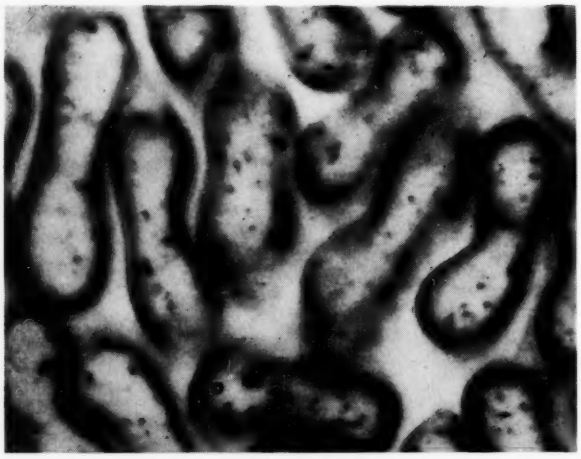

Figure 8
Cross section of Cationic Dye A dyeing

diffusion of the dye toward the center of the fiber. The fiber therefore becomes completely penetrated in a shorter period of time than is the case with a high affinity dye. This means a rapid exhaust rate of the dye from the bath to the fiber.

We can easily apply this theory to the leveling problem. If a dye strikes hard and is held tenaciously to the dye sites, it is hard to remove. Dyeing literature shows many cases of the relationship between affinity and level ness. In general, a lower affinity enables a dye to migrate more during the dyeing and results in better levelness.

The theory can also be applied to the stripping of dyes from the fiber. Since low affinity dyes are held less tenaciously to the dye site, weak cationic material such as the sodium ion in common salt can be used to displace the dye into the stripping bath. This makes the need for costly cationic stripping agents and chemicals used to decompose the cationic dyestuff unnecessary. In many cases a dyed fabric can be stripped to the desired strength with salt solution. In some cases 80% of the color can be removed with a one percent solution of sodium chloride.

The new Calcozine Acrylic dyes belong to this class of low affinity dyes. Consequently they dye levelly, penetrate well and reach equilibrium exhaustion in a relatively short time. In addition, the types selected for commercialization possess excellent fastness to light and washing.

SUMMARY

The theory that Orlon 42 is dyed on specific anionic sites by cationic dyes is supported by the results of our equilibrium dyeing studies. Relative affinity measurements show that previously available cationic dyes have very high affinity for Orlon 42. This results in poor leveling properties, in agreement with the behavior of other classes of dye on other fibers. However, these high affinities are also associated with poor rates of exhaustion, and microscopical cross sections show incomplete penetration of the dye into the fiber.

A new class of cationic dyes which have lower affinity and give level dyeings on Orlon 42 has also been studied. Dyeing rate curves indicate excellent rates of exhaustion and rapid attainment of equilibrium. Microscopical cross sections show complete penetration within normal dyeing times. Lightfastness ratings are 80 hours or better. Calcozine Acrylic dyes of this type are being developed on a commercial scale.

Figure 9
Cross section of Cationic Dye B Dyeing

ACKNOWLEDGMENT

The authors are grateful to other members of the laboratory for their assistance, especially to J Mecco for his practical dyeing data. Max Bender for his helpful contributions toward the theoretical development, and to F Gustafson and B J Barkouskie for the preparation of slides and cross sections.

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(1) Glenz, O, and Beckmann, W, *Textilber* **38**, 296-300 (1957).
(2) *Tech Bull (du Pont)* **12**, 13 (1956).
(3) Kienle, R H, Royer, G L, and McCleary, H R, *Textile Research J* **16**, No. 12 (December 1946).

TRADEMARKS

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Orlon—E I duPont de Nemours & Co, Inc
Textone—Olin Mathieson Chemical Corp
Calcozine—American Cyanamid Co

Rhode Island Section———

THE CONTINUOUS DYEING OF SYNTHETIC FIBERS AND BLENDS*

J J IANNARONE and W J WYGAND

Technical Laboratory
Organic Chemicals Department
E I duPont de Nemours & Co, Inc
Wilmington, Del

INTRODUCTION

HISTORY will undoubtedly record the rapid development and growth of synthetic fibers as one of the major achievements of the 20th century. Fibers which were not much more than a laboratory curiosity a decade ago are now a reality in many countries of the world, and production is counted in the millions of pounds per year.

To satisfy an ever-increasing demand for color, new dyes and novel dyeing procedures had to be developed for many of these fibers and their blends.

Batch dyeing procedures sufficed to satisfy the initial requirements for the interesting variety of garments in which the new synthetic fibers were utilized, but, as the volume of these fibers grew to meet the increasing demand, it was only a matter of time before serious consideration was given to continuous dyeing methods. Today several of these new fibers are available in sufficient volume to warrant continuous operation, and the time for commercialization of such operations is here.

DISCUSSION

During the past few years, various systems designed primarily for the continuous dyeing of synthetic fibers have been developed. These include among others, the Thermosol (*1,2,3,4*), Fluid bed (*5*), solvent dyeing (*6*), and molten urea (*7*) methods. One factor common to all these processes is that relatively high temperatures, usually between 250° to 500°F, are employed. This is understandable since many of the synthetic fibers, and especially the newer ones, are rather difficult to dye or dye relatively slowly under normal temperature conditions. Hence, in order to achieve satisfactory dye utilization in the very short times employed in continuous operation, the most reasonable expedient is to increase the temperature. It would be impractical to discuss the dyeing of the many synthetic fibers and their blends by all of the various procedures available. For this reason emphasis will be placed on those fibers and blends which are currently available in sufficient volume to warrant continuous operation with equipment readily available in many mills. Dacron polyester fiber, Orlon acrylic fiber, and nylon, especially in blends with other fibers, constitute the bulk of those fabrics which readily lend themselves to continuous dyeing. A brief discussion of satisfactory continuous procedures for each follows.

DACRON/COTTON (*8*) ——

Blends of Dacron polyester fiber and cotton usually in the proportion of 65% Dacron and 35% cotton can be processed continuously by either one or both of two procedures; namely, pad-steam and Thermosol. Generally, the dyeing of such fabrics falls into three main categories:

2) *Pastel shades*—dye cotton only with vat dyes by the pad-steam process.
2) *Light to medium shades*—dye the Dacron only by the Thermosol method.
3) *Medium to heavy shades*—dye both the Dacron and the cotton by the Thermosol and pad-steam procedures.

Good coverage in well-blended fabrics and adequate fastness can be obtained in pastel shades by dyeing only the cotton portion with soluble or insoluble vat dyes. As the depth of shade increases, however, dyeing of the minor component is not sufficient and coverage becomes increasingly poorer. It then becomes necessary to dye the Dacron or both components in order to obtain the desired solidity of shade.

TABLE I
Times and temperatures required for optimum dye fixation

Temperature (°F)	*Time (seconds)*
400	60–90
425	30–45
450	15–30
1000–1200	4

In some light to medium shades, dyeing only the Dacron by the Thermosol process will effect adequate coverage in well-blended fabrics. In medium to heavy shades, it becomes necessary to dye both fibers.

Dyeing by the Thermosol process involves padding the fabric with a dispersion of suitable disperse dyes, drying, and then subjecting the fabric to a temperature of 400° to 450°F for from 30 to 60 seconds, usually in a roller-type oven.

Recent experience indicates that radiant heat units can be used in place of the roller-type oven to effect fixation of the disperse dyes. Generally, temperatures of 1000 to 1200°F and an exposure time of about four seconds are employed in such units. In view of these very high temperatures, very close control over the short time of exposure is necessary. Optimum time and temperature conditions should be established for each fabric in the particular radiant heat unit intended for Thermosol work.

The time of exposure is dependent upon the temperature, depth of shade, and the fabric. The conditions generally required for optimum dye fixation are shown in Table I.

Utilization of disperse dye applied by the Thermosol process is good. Generally, between 75 and 90% of the originally padded dye is retained by the Dacron in the blend fabric. Furthermore, under properly controlled conditions, little or no fabric degradation will occur.

The Thermosol process has several distinct advantages over aqueous batch-dyeing procedures.

a) A continuous process; hence, large yardages can be dyed economically.
b) No carrier is required.
c) Excellent dye utilization.
d) Fabric processed in open width.
e) Simultaneous heat setting and dyeing.
f) Dyeing not affected by preheat setting.

In order to exercise optimum shade control and prevent contamination of

* Presented by J J Iannarone before the Rhode Island Section on May 16, 1958.

TABLE II

Disperse dyes suitable for application by the Thermosol Process

Latyl Yellow YL
" Yellow 3G
" Orange 3R
" Cerise B Paste*
" Scarlet FS Paste*
" Red GFS
" Blue 4R
" Brilliant Blue 2G
" Brilliant Blue BG
" Blue RB
Disperse Blue 8

* Paste types are recommended for padding operations.

equipment, only those disperse dyes which exhibit minimum vaporization in the Thermosol operation should be employed. A list of suitable disperse dyes is given in Table II.

Other procedures, such as the fluid bed or solvent dyeing, can also be used for dyeing the Dacron in blends with cotton. However, existing equipment can be utilized in the Thermosol operation, whereas the alternative procedures would involve new equipment.

ORLON/COTTON (*10*) ——The most popular blend of Orlon and cotton consists of 80% Orlon and 20% combed Egyptian or Pima cotton. Broadcloth, challis, and batiste constructions are particularly attractive for such end uses as dress goods, blouses, and sport shirtings. A full range of solid union shades, cross-dye and tone-on-tone effects can be produced on this blend by the continuous pad-steam dyeing procedure.

In pastel shades, cationic or selected disperse dyes give sufficient coverage of the cotton to produce acceptable unions with satisfactory fastness.

These dyes may be applied from a bath which contains 0.10 oz per gal of a nonionic surfactant, such as Alkanol HCS surface-active agent; 16.0 oz/gal ethylene carbonate[1]; and phosphoric or citric acid to give pH of 5 in the case of the cationic dyes.

The material is padded at 160° to 180°F, and steamed for 30 to 60 seconds at 212° to 230°F. The fabric is then rinsed, and soaped in two boxes at 200°F with 0.5 oz/gal of a nonionic surfactant, such as Alkanol HCS. and rinsed. The ethylene carbonate acts as a swelling agent for the Orlon and permits rapid penetration and fixation of the dye in the fiber.

[1]Toxicological data indicate this product to be nonhazardous; however, it is suggested that this be verified by communicating with the manufacturers and vendors—Jefferson Chemical Co, Inc, 260 Madison Ave, New York 16, NY; Union Carbide Chemicals Co, 30 E 42nd Street, New York 17, NY.

TABLE III

Vat dyes suitable for dyeing nylon/cotton unions (pad-steam)

Dye	*CI No.*
Vat Yellow 22	.....
Vat Orange 11	70805
Vat Brown 3	69015/6
Vat Brown 1	70800/1
Vat Green 8	71050
Vat Blue 14	69810
Vat Green 1	59825/6
Vat Black 25	69525/6

For medium and heavy shades, a two-step procedure is recommended in which cationic dyes and vat dyes are continuously applied to the Orlon and cotton respectively. Either fiber may be dyed first, but for greater efficiency in shading it is desirable to dye the cotton first. The following vat dyes stain Orlon excessively and should be avoided when dyeing medium and heavy shades since poor fastness to crocking may result:

CI Name	*CI No.*
Vat Orange 2	59705/6
Vat Orange 4	59710/1
Vat Brown 5	73410/1
Vat Violet 1	60010/1
Vat Violet 2	73385/6
Vat Violet 3	73395/6
Vat Violet 9	60005
Vat Blue 5	73065/6
Vat Green 1	59825/6

Satisfactory results have been obtained in the laboratory by padding the cationic and vat dyes simultaneously. However, this procedure must be scaled up before it can be recommended generally.

Selected vat dyes can be used to produce union shades on both fibers of the blend in shades ranging from pastel to heavy. Although these can be applied by the continuous pad-steam method, oxidation of the vats on the Orlon is quite difficult. It would be necessary, therefore, to interrupt the continuity of operation in order to oxidize the vat dyes by batch procedures.

NYLON AND BLENDS——

1) *Nylon and Cotton (11).* Nylon and cotton sheeting, shirting, and work clothing fabrics are usually made from an intimate blend in which the nylon component is present at the level of 25% or less. Due to the relatively small amount of the synthetic component in such blends, it is only necessary to stain the nylon slightly to get a good union with good fastness to light, washing, and chlorine. The pad-steam process is particularly recommended for dyeing these blends because, in continuous processing, there is little opportunity for the dye to transfer from the nylon to the cotton. Vat dyes recommended for this kind of work are listed in Table III. These same dyes can also be applied to automotive-type fabrics which are constructed so that the pattern is irregular and the nylon on the face does not exceed more than 30% to 40%.

TABLE IV

Dyes recommended for the continuous dyeing of carpeting

Capracyl Yellow GW
" Brown HR
" Brown 2R
" Red G
" Violet BD
" Gray GN
" Blue 3G
" Olive Green B
Neutral Brown BGL
Acid Orange 64
Acid Orange 60
Acid Red 182
Acid Blue 25 (*CI* 62055)
Acid Green 25 (*CI* 61570)

2) *100% Nylon.* Certain filament nylon materials, such as seat belts, tapes, and webbings, can be dyed by the continuous pad-steam method with selected acid and neutral-dyeing premetalized dyes. It may be necessary (particularly in heavy shades) to incorporate a swelling agent, such as benzyl alcohol, in the pad bath in order to effect maximum utilization and fixation of the dyes (*12*). The material is padded with a solution of the dyes and benzyl alcohol, steamed for five to six minutes, preferably in an acid atmosphere, scoured, rinsed, and dried. Dyeings made by this procedure exhibit good fastness to light, washing, and crocking.

3) *Carpets (13).* Recently, continuous pad-steam procedures have been developed for dyeing wool, nylon, and blends of these two fibers in carpet form. Selected neutral-dyeing premetalized types are padded on a specially designed Niptrol padder which will accommodate carpeting up to 15-foot widths. The material is then steamed for five to 10 minutes, depending upon the depth of shade, rinsed through a dilute acetic acid bath, extracted, dried, brushed, sheared, and finished for shipment. The successful demonstration of this approach in pilot plant operations offers sufficient encouragement to proceed on a production basis. Some suitable dyes for this purpose are listed in Table IV.

4) *Nylon Warps.* Nylon warps can also be dyed by the continuous pad-steam process with disperse acid, and neutral-dyeing premetalized acid types. The warps are padded with a dispersion or solution of the dye, steamed from three to five minutes, acid rinsed, scoured, and dried. Warp size may be applied in a subsequent

padding operation as required.

MISCELLANEOUS——Blends of Zefran and cellulosic fibers can be dyed by the continuous pad-steam process with vat or sulfur dyes to union shades which exhibit good fastness (*14,15*). To prevent yellowing of the synthetic fiber, concentration of alkali should be kept at a minimum. Concentrations of caustic soda and sodium hydrosulfite in the range of 0.5 to 2.0 oz/gal and steaming times of 20 to 60 seconds are recommended.

Union, cross-dyed, and tone-on-tone effects can be made on blends of Arnel and cellulosic fibers by applying selected disperse dyes to the synthetic component and vat, sulfur, or fiber-reactive dyes to the cellulosic portion. In a novel procedure developed by the Celanese Corporation of America, the disperse dyes are dissolved in a solvent such as triethylphosphate, padded, and steamed to effect fixation on the Arnel (*16*). The cellulosic component is then dyed by conventional procedures.

TOW——The continuous dyeing of various synthetic fibers in tow form has commanded considerable attention in recent years. Orlon, Dacron, and nylon tow can all be dyed by continuous procedures if desired.

A full range of shades can be made on Orlon tow by padding with a solution of cationic dyes containing about 50 g/l ethylene carbonate as an assistant, and steaming for about five minutes at 212° to 220°F (*17*). For very heavy shades, such as navies and blacks, as much as 100 g/l ethylene carbonate will be necessary to effect efficient utilization of dye. Superheating the steam to 240-260°F will improve the dye utilization in deep shades. It is understood that Dacron tow can be dyed continuously by the solvent-dyeing method. Nylon tow can be dyed with selected disperse acid and neutral-dyeing premetalized acid dyes by the continuous pad-steam method. The dyes and procedures employed are essentially similar to those previously described for the continuous dyeing of other nylon materials.

RAWSTOCK——Early in 1953, Du Pont introduced to the carpet trade a continuous procedure for dyeing wool rawstock in the last bowl of the wool scouring train (*18,19*). With this method, scouring and dyeing are carried out in one operation. Nylon rawstock can also be dyed continuously using the same dyes and methods that are used for wool.

The dyebath is charged with a predetermined amount of dye and sufficient formic acid to give a pH of 4.0 to 5.0. The addition of rawstock, formic acid, and dye solution is started and dyeing is carried out at rate of up to 3,000 lb/hour. Again, the neutral-dyeing premetalized dyes are particularly recommended for this application. Rayon rawstock can also be dyed with direct dyes by the same procedure.

The Du Pont Flowstock (*20*) process represents a modification of continuous dyeing in the scouring train. In this process, the rawstock, dye solution, and chemicals are entered at one end of a long tube; the rawstock is carried through the length of the tube by the gentle flow of the circulating liquor and is removed at the opposite end after dyeing. Since only a small portion of the liquor is exposed to air in the Flowstock machine, vat dyes and sulfur dyes can be applied to cotton and rayon rawstock continuously.

PAD-ROLL DYEING —— One system particularly worthy of mention for dyeing synthetic fibers and blends is the recently developed Svetema Pad-Roll method (*21*) (A B Svenska Textilmaskin-Fabriken, Goteburg, Sweden). Admittedly this operation is continuous only with respect to the padding operation; the fabric must remain in a batched condition to allow diffusion and fixation of dye in the fibers. However, when three or four of the removable fixative chambers are employed, the operation is practically continuous. The usefulness of this machine in applying direct dyes to cotton and rayon fabrics is an accomplished fact. More recently, however, it has been demonstrated that Dacron or Orlon in blends with wool or cellulosic fibers can also be dyed satisfactorily in the Pad-Roll system.

For dyeing blends with Dacron, the fabric is padded through a bath, containing the disperse dye and sufficient carrier, eg, Carolid, to accomplish fixation of the disperse dye, and batched. The roll is maintained in moist condition at a temperature of 205-210°F for about five hours, after which the other component in the blend is dyed by conventional procedures. The fabric should then be heat treated to remove residual carrier. A blended fabric composed of 65% Dacron and 35% cotton has been dyed successfully in semimill-scale run by this procedure.

CONCLUSIONS

The newer synthetic fibers and their blends can be dyed continuously with good results. The pad-steam, Thermosol, and solvent dyeing methods have reached an advanced stage of development although other more recent procedures, such as the fluid bed and solvent dyeing, are worthy of consideration.

The pad-steam method is particularly recommended for the nylon, acrylic, and modified acrylic fibers, and blends of these with other fibers. The Thermosol method is most suitable for Dacron polyester fiber.

A relatively unexplored but interesting approach for dyeing synthetic fibers and blends in fabric form is the Svetema Pad-Roll Machine. Preliminary semimill-scale work in this equipment on various synthetic fiber blends is very encouraging.

With the ever-increasing demand for the newer synthetic fibers and blends of these with other fibers, full-scale commercialization of continuous dyeing operations is expected in the near future.

TRADEMARKS

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LITERATURE CITED

(*1*) Gibson, J W, U S Pat 2,663,612 (1953).
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(*10*) Turnbull, S G; papers presented at Technical Advances Conference, E I duPont de Nemours & Co, Inc, Wilmington, Del, April 25, 1957.
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(*13*) Wygand, W J, *Am Dyestuff Reptr* **46**, P987 (1957).
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(*19*) (cf Ref *13*).
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(*21*) Erickson, C O, Landquist, N, and Mellbin, B, *ibid* **44**, P877 (1955).

AATCC Calendar

COUNCIL, COUNCIL COMMITTEES, RESEARCH COMMITTEES

Sept 17-20 (Hotel Charlotte, Charlotte, NC); Oct 30-Nov 1 (Conrad Hilton Hotel, Chicago, Ill); May 1959 (Montreal, Canada)

NATIONAL CONVENTIONS

Oct 30-Nov 1, 1958 (Hotel Conrad Hilton, Chicago); Oct 8-10, 1959 (Sheraton Park and Shoreham Hotels, Washington, DC); Oct 6-8, 1960 (Sheraton Hotel, Philadelphia, Pa); September 28-30, 1961 (Buffalo, NY); 1962 (Southern Region)

DELAWARE VALLEY SECTION

Sept 12 (Wilmington Meeting), Oct 17, Dec 5

METROPOLITAN SECTION

Oct 3 (Kohler's Swiss Chalet, Rochelle Park, NJ)

NIAGARA FRONTIER SECTION

Sept 26 (Niagara Falls, Ont); Dec 5 (Buffalo, NY); Feb 20 (Niagara Falls, Ont); April 4 (Hamilton, Ont—joint meeting with CATCC)

NORTHERN NEW ENGLAND SECTION

Sept 12 (Outing—Wachusett Country Club, West Boylston, Mass); Oct 17 (QM Research & Development Ctr, Natick, Mass); Dec 5 (Hotel Vendome, Boston, Mass); Jan 16 (Colonial Club, Lynnfield, Mass)

PIEDMONT SECTION

Sept 19-20 (Hotel Charlotte, Charlotte, NC)

RHODE ISLAND SECTION

Sept 26 (Management Night — Warwick Country Club); Oct 23 (Providence Engineering Society); Dec 4 (Annual Meeting—Johnson's Hummocks Grille, Providence)

SOUTH CENTRAL SECTION

Sept 13 (Hotel Patten, Chattanooga, Tenn)

SOUTHEASTERN SECTION

Sept 13 (Ida Cason Callaway Gardens, Chipley, Ga); Dec 6 (Atlanta, Ga)

WESTERN NEW ENGLAND SECTION

Sept 26 (Hartford, Conn); Oct 24 (Annual Meeting—Rapp's Restaurant, Shelton, Conn; Dec 5 (Rapp's Restaurant, Shelton, Conn)

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58-15

Education: BS, textile engineering, Bradford Durfee College of Technology; Norwich Univ & Univ of Massachusetts (army specialized training); Boston Univ.

Experience: Dyeing and finishing, sales and sales representative, and assistant sales manager.

Position desired: Technical sales.

Location: South coast.

Age: 31; single; references.

8-25, 9-6

Activities of the Local Sections

Niagara Frontier

The fourth annual outing of the Niagara Frontier Section was held on Friday, June 27, 1958 at the St Catherines Golf Club in St Catherines, Ontario, Canada, with 50 members and guests in attendance. J D Noonan, National Aniline Div, served as outing chairman.

The program in the afternoon included a golf tournament and putting contest, followed by dinner and the presentation of awards and prizes in the evening.

Low-gross honors in golf were taken by Harold Miller for low gross —member and by James Linton, low gross—guest. Mr Miller was awarded the Plate Award of the Niagara Frontier Section. E P Carney took low net honors.

South Central

A Nominating Committee, composed of J D Mosheim, chairman, Lloyd Greenwood, J D Simmons, E A Schlirf and Frank Smith has nominated the following candidates for the offices of the South Central Section:

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STUDENT CHAPTERS

Alabama Polytechnic Institute, Bradford Durfee College of Technology, Clemson College, Georgia Institute of Technology, Lowell Technological Institute, New Bedford Institute of Technology, North Carolina State College, Philadelphia Textile Institute, Rhode Island School of Design

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LITERARY STYLE AND FORM OF PRESENTATION—In the writing of papers, authors are requested to observe a trenchant, simple style of writing directed to textile chemists and colorists with at least an elementary knowledge of chemistry, physics, mathematics, engineering, textile processes and textile machinery.

In the organization of the material, there should be one or more introductory paragraphs setting forth the occasion, significance and main objectives of the paper and of the method of attack. This should be followed by the body of the presentation, either with discussions interspersed throughout this portion or with a collected section marked "DISCUSSION" after the main body of the paper. Finally, there may be a brief section at the end entitled "SUMMARY" or "CONCLUSIONS."

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AUGUST ANTIPHON
1958

Inter Alia — Inter Nos

P J WOOD

MODERN HISTORY

"The old order changeth, yielding place to new," and so it is with the calico printing business. Of late the changes have followed one another in such quick succession that it has been hard to keep track of them.

The recent closing of one of the oldest printworks in the country brings these thoughts into our mind together with a mental picture of many men of the past who made history in this industry in their time. With the passing of the old U S Finishing Company from the scene, we witness the break-up of an empire which, at one time, constituted the largest ownership of printing machines in the world, spread around in several individual printworks to be sure, but one single business organization.

Of course, the very largest single printworks was Pacific Print Workes in Lawrence, in which there were 50 printing machines in one room. The next largest was the American Printing Company, owned by the Bordens, where they had 42 machines, which might also be said to be in one room, although the room had a right-angled turn in it.

These two giant enterprises were superintended successively by one man, Arthur Hirst, a very regular member of that very ancient body known as the COLORIST'S CLUB, which has had among its membership during the sixty-odd years of its existence most of the men who practiced the art of textile coloring and ran the various printworks between 1892 and now. Among them may be remembered Alfred Lustig, Henri Schaeffer, John MacAdam, William Herrick, Joe Oesterle, Arnold Bossi, Joe Hindle, Ray Caffrey, Dr De Goencz, Andre Schoen, Bob Lyons, Ed Farnworth, Charlie Kendall, Edward Guiterman, Charles Roberts (Canada), Andrew Armstrong, Bill Broadfoot, Joe Bennet. With the possible exception of Edward Guiterman, all these members are no longer with us in the flesh. Mr Guiterman has not attended meetings for years and we have no news of him. He is or was, as the case may be, the brother of that ingenious and interesting poet, Arthur Guiterman, who published "Chips of Jade", a poetical rewriting of the sayings of Confucius and other celebrated Chinese writers. You may remember his translation of Indian sayings under the name of "Betel Nuts" from which we quote this literary and philosophical gem:

"This under the Rose,
But it's true to the letter;
The Man thinks he knows,
But the Woman knows better".

WASH 'N' WEAR

Whenever a new idea in finishing appears on the market, frequently the result of months, aye, even years of patient work, in some cases, there is always someone jumping in with a hastily improvised and half-baked imitation.

For a while, the spurious counterfeit rides on the coat-tails of the genuine, worthy product, until it is presently found out, given a right smart kick in the pericardium and pitched into outer darkness.

In the interim, between its glorious entry and its ignominious exit, it has done itself no good, but it has done the worthwhile products a lot of harm; so much so that what could have been a far-reaching general improvement in textile processing and a profitable idea to the finisher and to the converter, turns out to be a foul fiasco. Worst of all, the confidence of the purchasing public is shattered and this takes a long time to repair.

Mark Twain said he once had a cat that sat down on a hot stove. He remarked that what the cat should have learned from this experience was not to sit on a hot stove. What he actually learned was, not to sit down on any stove.

Don't we all have a tendency to learn the wrong things from our experiences?

The public is very much like Mark Twain's cat. They buy a cheap article labelled WASH & WEAR, find it putrid, then condemn all WASH & WEAR.

But Good Housekeeping is doing something about it. If they put their stamp of approval on it, to use the colloquial English of a product in another field, "it's got to be good". And if George Wham is responsible for the testing, we would say, in our own English, it must be good.

There is one thing the dyeing industry has never tried yet, so far as we remember: that is, the policing of its own products. Maybe this would inspire the confidence of the public in that sorely abused craft. A central laboratory could vouch for the validity of the claims made for the particular finish. be it crease-proofness, dimensional stability, water- or fireproofness, or wash & wear.

The dyers have journeyed too long along that route that is said to be paved with good intentions, why not try something of this sort?

MORE OF THE SAME

The latest group of national importance to become addicted to the WASH 'N' WEAR habit is the army of letter carriers of the United States, according to a recent press release.

In this communication we note a new expression descriptive of the style presently under discussion, "the new easy care trousers", which we do not remember having heard before. But then, we haven't heard everything.

The weight of the new fabric, which consists of 70% Dacron polyester fiber, 20% Orlon acrylic fiber and 10% mohair is about eight ounces per yard against 10 to 13 ounces for the conventional summer uniform fabrics. After painful calculation we arrive at the conclusion that the saving in weight per pair is roughly one pound. Whether this means one pound net net relief for the postman or whether Mr Summerfield will hand him an extra pound of the type of mail addressed "Occupant", which both we and Mr Summerfield would just as soon be without, we know not.

When we learn of any of our friends in the post office investing in some of these newfangled garments, we will report further, unless, in the meantime, the maker should send us a pair for scientific appraisal (for which we would not think of making any charge, of course, purely pro bono publico), in which case we will be able to render a first hand (or should it be first leg?) opinion right from the shoulder, as it were, so to speak.

IT CAN BE DONE

According to biblical history, the Israelites had a hard time during the Egyptian captivity making bricks without straw.

But recent advices tell us that straw hats can now be made without straw. Or as Chemical News puts it, "Man-Made Fiber Gives Men's Hats Straw Look".

From time to time in our past life, we have been called upon to bleach a particularly dark type of straw, or reasonable facsimile thereof, ten times whiter than it was wont to be bleached. And some of those foreign hat straws, or maybe it would be more correct to call them fibers, are what Elmer would call "beauts".

Some of them take days of processing to make them look anything like a decent white, and then only with all the help that can be coaxed from the fluorescent whitening agents.

We have a faint idea that these man-made fibers might be easier to bleach than straw, which should give the ultimate in whiteness. Also it is quite possible that inadvertently sitting on such a hat may not be as deadly fatal as it is apt to be with the conventional stiff straw.

Besides being virtually crushproof, these strawless straw boaters are said to weigh less than 2½ ounces or about half the weight of the old type of headwear. They take a load off your head.

Although the season is well along, as we write this startling item, we have yet to see one of these new inventions. This might prove to be the revival of the hat business, as far as summer styles are concerned.

Let us weep for the straw man. Let us rejoice with the man-made fiber man. "Le roi est mort! Vive le roi!" (the king is dead, long live the king!).

MEMORANDUM

Happiness, like a good meal, should be enjoyed three times; once in anticipation; once again in realization; and finally in retrospect.

O TEMPORES! OR MORES!

Sure, these are hard times, but, by way of encouragement let us remember the words of Charles William Eliot, president of Harvard, he of the five-foot bookshelf:

> "Let us remember that the times that future generations will delight to recall are not those of ease and prosperity but those of adversity bravely borne".—Q. E. F.

• PATENT DIGEST •

PAUL WENGRAF

CREASEPROOFING OF TEXTILES———Soft hand on starch-sized fabrics G,2,04

USPat 2,808,341 (Dan River Mills———Canter ———Oct 1, 1957)

A full, soft hand on wrinkle-resistant textiles reportedly can be obtained by impregnating starch-sized fabrics with resin-forming components, a catalyst, and *starch-converting enzymes* (amylases) under such conditions that the starch is partially hydrolyzed but not completely converted into sugar. Thus the amount of enzyme has to be carefully regulated. The impregnated goods have to be stored for a certain time, preferably for one to four hours at 140-180° F before the activity of the enzyme is halted by drying and curing as usual. Bacterial enzymes which may be used in this process are sold under the tradenames Rapidase, Ergase, Excise, etc (cf *AATCC Year Book*, Part V).

The process is particularly adaptable to fabrics made from starch-sized warps. Urea- or melamine-formaldehyde precondensate resins of any kind may be applied. Since some of these resins as well as some catalysts may have an adverse effect on the enzyme action, the proper material should be selected. This specification mentions the investigation of Sink and Worth in *Am Dyestuff Reptr 40*, 848 (1951) regarding the effect of resin-forming materials and catalysts on enzyme activity. A table, which compares the adverse effects of various catalysts and resin condensates, shows that monoethanolamine hydrochloride especially has a negligible effect only in this respect.

Example: A corn starch-sized, all-cotton fabric was padded to a 70% wet pickup in a liquid containing in aqueous dispersion Prosotex (as a wetting and softening agent), Triton X-100 (as a nonionic emulsifier), Rhozyme A (a bacterial enzyme), Zeset S (a 50% dimethyl ethyleneurea solution) and monoethanolamine hydrochloride (catalyst). The pad solution was kept at 160° F. The impregnated fabric was stored on rolls for four hours at this temperature, then dried and cured for 70 seconds at 350° F. A wrinkle-resistant effect and, at the same time, a full, soft hand could be observed. The softening effect was still apparent after one hour storage. On the other hand, white portions of the fabric became distinctly yellowish when the storage time had been increased to six hours, pointing out the conversion of the starch size into sugar.

References cited by the Patent Office:

USPat 2,137,465 (Rohm & Haas/1938): crease-resistant finishes based on resins, preferably urea-formaldehyde condensates, and combined with high-substituted quaternary ammonium salts to obtain a softer hand.

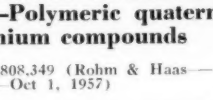
USPat 2,302,310 (Rohm & Haas/1942) describes stable starch pastes composed of partially hydrolyzed starch and a water-soluble urea-formaldehyde condensate.

ANTISTATIC TREATMENT ———Polymeric quaternary ammonium compounds G,1

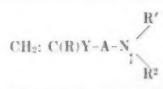
USPat 2,808,349 (Rohm & Haas———Melamed ———Oct 1, 1957)

Some quaternary ammonium compounds have been used heretofore for the antistatic treatment of hydrophobic articles. Many of these compounds reportedly have a temporary effect only, not resisting washing, scouring or drycleaning.

According to the current invention, an antistatic finish applied from aqueous solutions or dispersions, which becomes resistant to the above operations by aging or curing, can be provided by using certain quaternary ammonium compounds, substituted by unsaturated chains. The general formula of these polymerizable compounds is



where R is hydrogen or methyl; Y is O, CONR or COO; A is an alkylene chain; R′ and R^2 are short alkyl chains; X is anion; and R^3 is allyl or methallyl. The last named substituent (R^3) is essential for the capability of the polymer to be cured to insoluble state. These compounds generally are prepared by *first polymerizing* a tertiary amine of unsaturated character, thus (using the symbols of the above formula)



according to known procedures in the presence of peroxide or azo catalysts, and *then quaternizing* part or all of the tertiary N-groups with allyl halide or methallyl halide.

Products in which a short alkylene group (A) is present are said to be water-soluble while compounds bearing longer chains are water-dispersible, optionally requiring special dispersing agents, such as polyethoxylated alkylphenols. The optimum solid content of these solutions (dispersions) is given as two to 10%. Applying the products from polar organic solvent solutions is within the scope of this method; in this event, metallic driers (manganese stearate or the like) may be added as curing agents.

After the polymer solutions or dispersions are applied, the fabrics may be dried at air temperature or up to 212° F and exposed for curing to higher temperatures (220-450° F and preferably to 290-310° F).

Example: A toluene solution of methyl polyacrylate was condensed with dimethylamino propylamine and polymerized. The resulting polymerized amine was diluted with ethanol and quaternized with allyl-chloride. A light, tan-colored, readily water-soluble powder was obtained. Fabrics of nylon, Dacron or Orlon were padded in a five percent solution of the polymer, air dried and cured. Marked reduction in the tendency of developing static charges and substantial resistance of the effect after five launderings are reported.

References cited by the Patent Office:

USPat 2,595,225 (Du Pont/1952) describes polymeric, polyquaternary ammonium salts, containing recurrent ammonium salt units, in which the N-atom is not an integral part of the main polymeric chain; these polymers can be used, among other applications, as bactericides, fungicides, or as antistatic agenis for nylon.

USPat 2,626,877 (Am Cyanamid/1953) refers to treatments of shaped articles made from thermoplastic vinyl resin with high alkyl- (optionally alkenyl-) group-substituted ammonium compounds to prevent accumulation of static charges.

DYEING OF POLYACRYLIC-CELLULOSE ESTER FIBER BLENDS———N-compounds added to cuprous ion dyebaths C,4,07

Brit Pat 784,191 (Soc Rhodiaceta———Oct 2, 1957)

Dyeing of polyacrylic fibers by the the cuprous ion technique is standard practice. This method, however, cannot be applied to mixtures of these fibers with cellulose derivatives, ie,

cellulose esters or cellulose ethers.

According to the current patent, a process for dyeing the aforementioned fiber blends calls for incorporating into the cellulose ether or -ester portion a colorless organic nitrogen compound having an affinity therefor and *simultaneously or subsequently* dyeing with water-soluble dyes in the presence of cuprous ions.

The N-compounds to be used may be saturated heterocyclic substances with 3-7 ring members, cycloaliphatic amines, amides obtained from polymethylene diamine with higher monocarboxylic acids, and the formaldehyde-bisulfite complexes of these compounds. A product repeatedly mentioned in the examples is bis 4-4'-(cyanoethylamino)-dicyclo hexyl methane.

The water-soluble dyes may be acid, direct or disperse dyes.

It is possible to pretreat the fibers with the N-compound or to introduce it directly into the dyebath and thereupon to add the cupric salt and the reducing agent. Most of the examples refer to a two-step treatment.

Example: A fabric composed of cellulose acetate and polyacrylonitrile threads was introduced first in a bath containing the formaldehyde bisulfite complex of bis -4-4'-(cyanoethylamino)- dicyclo hexylmethane plus a wetting agent, then rinsed and dyed for one hour at the boil with five percent *CI* Acid Blue 25 and 0.6% *CI* Acid Red 88. Thereafter, copper sulfate and sodium formaldehydesulfoxylate were added and boiling was continued for 20 minutes more. A royal blue of very level appearance reportedly resulted.

Reference may be made to prior literature describing treatments of cellulose esters with nitrogenous compounds to increase the affinity for acid dyes. Brit Pat 437,274 (Imp Chem Ind/1935) advocates the use of high substituted ammonium salts, while Brit Pat 484,984 (I G Farbenind A G/1938) refers to reactions of amino- or ammonium compounds or ethylene diamine derivatives with artificial fibers, including polyvinyl or polyacrylic fibers (cf particularly example 8 of this specification).

EMBOSSED PIGMENT PRINTING EFFECTS——— Paste containing metal driers applied G,4

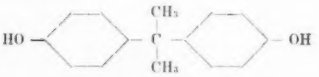
Brit Pat 784,336 (Ciba Ltd———Oct 9, 1957)

The preamble to this patent refers to pigment printing methods based on resin fixation and, on the other hand, to methods for durably embossing fabrics by applying resin precondensates, drying at lower temperature, embossing and curing. Obviously *simultaneous printing and embossing* is technically very difficult, because the printing composition has to withstand the high temperature of the embossing roller (up to 200° C) without prematurely hardening or dropping off the embossing rollers, which serve here as the color printing means.

This problem reportedly has been solved by padding first with a hardenable resin precondensate (a), squeezing, drying at moderate temperature and thereupon introducing the fabric to an embosing calender, where a paste containing the pigment, a metal drier (b) and a resin capable of undergoing oxidative drying (c) is fed by a series of rubber rolls to the raised portion of the embossing metal roller, which corresponds to a complementary negative roller covered with paper. It is essential that the composition [pigment, (b) plus (c)] must not remain for too long a time on the heated embossing roller. Then the fabric may be cured for a short time as usual.

The hardenable resin precondensates (a) to be used herein may be etherified methylol compounds, eg, polymethylolated melamine etherified with more than three (preferable four to six) allyl groups. Metal driers (b) are the known oil-soluble compounds of di- or polyvalent metals, particularly naphthenates of lead, calcium or cobalt. For (c), known modified alkyd resins as well as epoxide compounds obtained by condensing epichlorohydrin with a polyalcohol or phenol and modified with unsaturated fatty acids are suitable.

Example: A cotton fabric was padded with a composition (a) of a methylated methylolmelamine and a quaternary derivative thereof obtained with stearic acid methylolamide, triethanolamine and benzylchloride (specifically described in Brit Pat 748,016, example 4) and dried at 80° C to a moisture content of 10-15%. It was then introduced into an embossing calender where the embossing roller was heated to 200° C. A printing paste fed to the roller contained an azo- or phthalocyanine pigment, one of the metal driers (b), and epoxy compound obtained from



ie, 4-4' dioxy diphenyl dimethyl methane and epichlorohydrine and esterified with linseed oil fatty acids. After being printed, the goods were hung up for five minutes at 145-150° C, washed and dried. Washfast colored embossed effects resulted.

Thus the embossed effect and the pigment are fixed by two different types of resins in the same operation.

ACID DYEING OF WOOL WITH CERTAIN METAL COMPLEX AZODYES———Ethylene oxide condensates as assistants C,4,06

Brit Pat 784,664 (Farbenfabr Bayer———Oct 16, 1957)

This patent refers to the dyeing of wool with specific metal complex azodyes containing *less than one complex-forming metal atom* on one mol of an azodye, bearing no acid, water-solubilizing group, thus no sulfonic acid radicle. According to four examples of appropriate metallized azodyes presented on p 2, lines 11-38, the constitution of these dyes is characterized by a content of one chromium or cobalt atom linked to two mols of the insoluble azodye.

With this type of dyestuff, level dyeing may be effected only in neutral dyeing, which may affect the quality of the wool. Acid dyeing, which would be generally preferable, requires specific leveling agents in operating at pH of 4-5.

According to the present method, wool can be dyed uniformly at pH 4-5 by using, as leveling agents, condensation products of *at least 30 mols ethylene oxide* on one mol of a hydroxy compound (oleylalcohol or stearylalcohol) or on one mol of a primary or secondary amine (cetylamine). In addition, these reaction products reportedly have the advantage of permitting correction of uneven dyeing by an aftertreatment in an acid bath.

Example: Wool gabardine piece goods were dyed a level beige shade on the winch with a mixture of three dyes of the aforementioned azo dye group, while the reaction product of one mol oleylalcohol with 60 mols ethylene oxide, further sulfuric acid, and Glauber's salt were added to the dyebath. The pH was measured at 4.5. Dyeing was started at 40° C, the bath brought to the boil within 45 minutes, and boiling continued for two hours.

Reference may be made to USPat 2,763,529 (Ciba Ltd/1956), which refers to dyeing with premetallized azodyes, carrying *one sulfonic acid group* in the presence of condensates of higher amines (dodecylamine) with ethylene oxide [cf *Am Dyestuff Reptr* 46, 375 (1957)]. USPat 2,638,404 (Am Cyanamid/1953) refers to dyeing with premetallized dyes in the presence of high-alkyl-substituted guanamines, condensed with large amounts of ethylene oxide [cf *Am Dyestuff Reptr* 43, 67 (1954)].

News of the Trade

General Aniline Consolidates Research Program

In a move to emphasize and consolidate the research program of the Dyestuff and Chemical Division of General Aniline & Film Corporation, transfer of the major section of the division's technical laboratory from 435 Hudson St in New York to the Company's Central Research Laboratory in Easton, Pa, has been announced.

At the same time, M R Stevinson, director of research, and H G Shelton, director of marketing, who made the announcement jointly, disclosed full details of the new program, which includes top level staff promotions and appointments. In the main, the Hudson St laboratory, which served both General Dyestuff Company and Antara Chemicals, will be integrated into an applications research and technical service function of the research department. All of the laboratory's functions with the exception of that concerned with pigments and customer service in support of the New York-Philadelphia and export sales offices will be transferred to the Easton Laboratory. The latter will be retained in New York and the pigment laboratory will be removed to the Company's Linden, NJ, plant.

Concurrent with these moves, J M Wilkinson, manager of the Central Research Laboratory at Easton, announced the appointment of G M Gantz as program manager, applications research and technical service, with these assistant managers in the fields indicated:

J L Azorlosa, polymers and acetylene chemicals; L Fusser, dyes and technical chemicals; F E Woodward surfactants and other industrial chemicals; and J P Beiswanger, general exploratory applications research and technical service.

F J Gajewski, manager of process research and development at Linden, stated that applications research and technical service on pigments will be integrated with the pigment laboratory at Linden under the supervision of James Gannon, a member of the staff of Leon Katz, section manager of dyes and pigments.

The customer's service laboratory continuing in New York, will be under the supervision of H C Bock on the staff of H A Horstmann, New York-Philadelphia Branch Manager. C M Knowles, technical manager of the marketing department, will be responsible for liaison between the marketing and research departments relative to applications research and technical service in support of sales.

In a statement on the new research program, P M Dinkins, General Aniline vice president in charge of the dyestuff and chemical division, said the changes were designed to "meet the need for a greater degree of coordination and for a greater effectiveness of the marketing and research department activities.

"Customer service and the continuing developing of new products with improvements in the older products have always been a bulwark of General Aniline's success," said Mr Dinkins. "I am confident that these changes will further strengthen that policy."

The stepped up activity at Easton will result in a total of 36 new research functions there and the employee roster will be increased from 83 to 129, including chemists and supporting personnel.

At Linden, six new functions will be added, bringing the total there to 70. This integration of the pigment research activities points up the Company's stepped-up activity in the pigment market, which was spotlighted first with the formation of a special pigment department two years ago.

GE's Silicone Products Dept Occupying New Facilities

A new laboratory offering excellent facilities for the development of new silicone products is now being occupied by the Silicone Products Department of the General Electric Co. Part of a continuing program of expansion, the new laboratory provides about double the space previously available for product development work.

A two-story brick structure, the laboratory houses complete equipment and services required for study of new silicone gums and rubber compounds, silicone fluids, resins and emulsions. Also located there are advance development laboratories, complete library facilities, management offices and conference rooms.

It is reported that a considerable portion of the department's analytical services activity will also be performed in the new laboratory as soon as supplementary equipment now on order is delivered and installed.

The new building is part of the latest expansion of the General Electric silicone operation. Begun in 1956, this expansion will be continued through 1958 and 1959 in conjunction with the Operation Upturn program being conducted by General Electric throughout the country.

Major items in the Operation Upturn program for G-E silicones are the completion and equipping of a new process development laboratory and conversion of the original product laboratory into a marketing technical center. These projects are expected to be completed during 1958-59, along with further expansion of production facilities.

Total costs for the current expansion of silicone facilities will exceed $5,000,000, according to Charles E Reed, department general manager. This figure includes the purchase of an additional 69 acres of land acquired at Waterford two years ago. Most of this land has been earmarked for growth expected in the 1960's. Despite the substantial increase in research and development at Waterford, the fundamental research in silicone chemistry begun at the General Electric Research Laboratory in Schenectady will be continued there, the G-E executive emphasized.

The occupied portions of the new laboratory were featured in an Operation Upturn Open House held recently at the Waterford plant. Formal dedication of the new laboratory will be held later this year when the building is fully equipped and occupied.

GE Silicone Products Dept laboratory at Waterford, NY

WEATHERPROOF RADAR SHELL———This mammoth globe of reinforced plastic is designed to take the rough arctic weather and improve the mechanical operation of radar installations in North American defense outposts. The hard surface shell is protected from weather and chemical deterioration by an outside layer of Dynel fabric. A similar inside lining reduces fire hazards.

Easy portability is an equally important advantage of this radome. Consisting of 156 panels that fit together tongue-in-groove, it can be shipped in a single transport plane and erected in 125 man-hours. This radome measures 55 ft in diameter, is 40 ft wide at the base and weighs 9,000 pounds. It was developed for the Royal Canadian Air Force's defense system.

Production Underway at Goodrich Acrylic Acid Plant

Production is now underway at the newly completed Good-rite glacial acrylic acid plant of B F Goodrich Chemical Company in Calvert City, Kentucky. The new plant brings glacial acrylic acid into quantity production for the first time in this country, according to John R Hoover, president. The new unit has a capacity of several million pounds per year.

"Use of this versatile, highly reactive monomer in small quantities imparts increased adhesion and curability to many resinous and plastic materials," Hoover said. "When polymerized alone or as the major ingredient with other monomers, Good-rite acrylic acid results in water-soluble resins with a wide range of useful properties." These resins are used as textile sizes, sand core binders, latex thickeners, and flocculating agents. Since the acid is a glacial product containing no water, it is useful also for making special acrylic esters.

The acrylic acid plant is the third unit BFG Chemical has constructed in Calvert City, alongside facilities for the production of vinyl chloride monomer and acrylonitrile. The chemical firm also has plants at Louisville, Kentucky; Akron and Avon Lake, Ohio; Niagara Falls, New York; Haledon, New Jersey; and Henry, Illinois.

Rodney Hunt Appoints Hayes Textiles

The Rodney Hunt Machine Co has announced the appointment of Hayes Textiles, Inc as exclusive sales representative for its full line of textile wet-finishing machinery and industrial rolls in the southern US region. With headquarters in Spartanburg, South Carolina, the full organization of Hayes sales engineers will provide complete service and engineering assistance for Rodney Hunt customers and prospects from Virginia and Kentucky south to Alabama. Hayes will also maintain warehousing facilities for stocking replacement parts for the Rodney Hunt line.

Fabulized Adds Five New Licensees

John L Fancourt, president of Fabulized, Inc, and Harry Eisenberg, president of Citation Fabrics Corp, have announced that five additional lingerie manufacturers have been licensed to use Fabulized nylon tricot in their garments. This makes a total of 18 lingerie cutters now included in the Fabulized program.

The manufacturers are: Charlet Underwear Corp; Florelee Underwear Co, Inc; Lionell Lingerie; Jack Rappaport Co and Preview Lingerie Inc, all of New York.

Cyanamid's Fibers Div and Textile Chemical Dept Open New Sales HQ

American Cyanamid Company's Fibers Division and the Textile Chemicals Department of the company's Organic Chemicals Division have opened modern sales headquarters at 111 West 40th Street.

The new offices, selected to bring the Cyanamid organizations into the heart of New York's textile area, comprise about 20,000 square feet of space, covering the entire 16th floor of the recently completed building.

Included in the new quarters are the offices of Fibers Division management; sales, merchandising, advertising and promotion offices, display rooms and other facilities for improved service.

Fibers Division, headed by Alden R Loosli, general manager, will begin limited marketing of Creslan, Cyanamid's acrylic fiber, to the trade this fall. Production of the fiber on a limited commercial scale will begin late this year at a modern, multi-million dollar plant now under construction in Santa Rosa County, near Pensacola, Florida. Upon completion, the plant will have an annual capacity of 27 million pounds of Creslan staple and tow, it is claimed.

The fiber, now being produced at a pilot plant in Stamford, Conn, reportedly will have applications in knit goods, suitings, coatings, dress and shirting fabrics, simulated fur fabrics, hosiery and underwear, blankets, carpets and home furnishings fabrics, as well as in industrial uses.

Cyanamid's Textile Chemicals Department markets a complete line of textile chemical finishes. Most of the department's production facilities and its textile application laboratories are at Cyanamid's Bound Brook (NJ) Plant. L A Fluck is department manager.

Telephone service to the new sales headquarters will continue to be through Cyanamid's general offices at 30 Rockefeller Plaza.

Kessler Chemical Doubles Production Facilities

Kessler Chemical Co, Inc, Philadelphia, Pa, a pioneer firm in the development of industrial organic esters, is now in production in its second manufacturing plant at Cottman Avenue and State Road. According to W B Pings, general manager, this new facility doubles plant capacity and provides improved production units for glycerol monostearate, synthetic waxes, surface-active agents and various other fatty acid derivatives.

"Fibers and Civilization" Available for Showings

"Fibers and Civilization," a new color motion picture filmed for the Chemstrand Corporation by MPO Productions, Inc, is now available for showings on television, at schools, before civic groups, at exhibits and before segments of the chemical and textile industry.

The film is currently being shown on a regular schedule in the U S Pavilion at the Brussels World's Fair as one of a group of industrial and documentary motion pictures selected to illustrate American life. Distribution in this country is being handled by Modern Talking Picture Service, Inc, New York, NY.

"Fibers and Civilization" presents the story of the modern chemical fibers as a logical development in the long history of fibers and fabrics. As background for the step which brought mankind into the age of "fibers nature never dreamed of," the Chemstrand film traces the development of natural fibers from the fringes of recorded history to the present day.

Clemson Announces Changes in Textile Curricula

Changes in textile school curricula have been announced at Clemson College to strengthen work in science, business and humanities while retaining adequate specialization in technology.

Effective in September, the textile manufacturing course officially becomes textile management, and textile engineering becomes textile science.

"We are giving students the best core of technical and managerial courses that we can," says Dean Gaston Gage. "We are also giving them the usual sound courses in English. Beyond that, the textile management students specialize in the social sciences; the textile science students emphasize the basic sciences."

The revisions in textile management consolidate all textile technological subject matter in less credits and less class hours. Two semesters of quality control, a course in English—report writing and planning, and three new credit hours of social sciences are added.

The new textile science curriculum reportedly provides a stronger program for students who plan to enter the textile industry than was formerly presented in textile engineering. Basic sciences replace applied engineering subjects. New courses are in the fields of advanced physics, advanced mathematics and organic chemistry, in addition to the two semesters of quality control.

Only minor changes affect Clemson's third degree-giving textile curriculum, textile chemistry. These are largely consolidation of textile chemistry subjects to make room for quality control.

Each curriculum has a one-credit seminar course, with guest speakers to be scheduled. Speakers will be presented from all phases of the industry.

The textile program here has been under study since last October by a textile faculty committee. Headed by Chairman J L Thompson, it is comprised of W T Rainey, E A LaRoche and T D Elfand.

FRL Scientists Report Shrinkage Research

A fundamental study into the shrinkage problem was the subject of a paper delivered by Norman J Abbott, senior associate at Fabric Research Laboratories, Inc, Dedham, Mass, on July 7 at the Gordon Research Conference on textiles in New London, NH.

The paper, entitled "Tension Changes Occurring in Textile Materials during Wetting and Drying" was co-authored by Abbott, Freddy Khoury and Leo Barish, all members of the FRL staff.

Past studies on shrinkage, according to the authors, have been concerned with dimension and tension changes in the completely wet and completely dry fabric, little attention being paid to the series of changes which occur *during* the wetting and drying process. "It is necessary to take a basic approach," Abbott stated, "to define and understand all the changes occurring during the entire process, that from a more thorough understanding of *all* the mechanisms involved in shrinkage, further research in processes and equipment will have a more complete foundation."

The authors described work they had done on a series of viscose and acetate fabrics with varied ends per inch, filament size, yarn twist, and weave, and comparisons they had made between filament and staple fiber fabrics.

Although research is still in progress, they reported an understanding of the *tension* changes which occur at all stages from a completely wet to a completely dry fabric. The identification of these changes is not new, the authors reported, but until this research there was no understanding of their causes.

Studies of *dimension* changes showed them to be related to the changes in tension but their interpretation is more complex and not yet fully understood, they reported.

The authors particularly cited previous work by Peirce, Collins and Harwood, who laid the groundwork for understanding the mechanisms of shrinkage. It is their hope, however, that their studies will expand concepts previously developed, they concluded.

Dow Enters Iminodiacetic Acid Production

The Dow Chemical Company has begun production of iminodiacetic acid at its Midland, Michigan, Division and is believed to be the only producer of this material at present.

Iminodiacetic acid is a difunctional acid now available in commercial quantities. It is used as an intermediate for surface-active agents, complex salts and chelating agents. Likely markets are in the textile, general chemical, pharmaceutical and plastics fields.

Course in Engineering Physics

A four-year course in engineering physics leading to the bachelor of science degree will be instituted at Lowell Technological Institute in September, according to Martin J Lydon, president. The program, approved by the board of trustees, was developed to meet the demands of industry, education, and government for people intensively trained in physics and mathematics to help solve some of the problems of the current crisis in science.

Charles R Mingins, chairman of the division of engineering and head of the department of physics and mathematics will head the new course.

The course brings to a total of 11 the number of undergraduate programs of study offered at the 63-year old coeducational engineering college. Other BS degree programs are presented in chemistry, textile chemistry, and textile technology, and in electronic, general, leather, nuclear, paper, plastics, and textile engineering. Lowell Tech also offers the PhD degree in chemistry and the MS degree in chemistry and textile chemistry and in electronic, leather, paper, and textile engineering.

• NEW PRODUCTS AND DEVELOPMENTS •

ChemPleat Process

The development of a new method of pleating chemical textile or thermoplastic fabric blends has been announced by The Chemstrand Corporation, producer of Acrilan acrylic fiber and Chemstrand nylon.

Called the ChemPleat process, the new technique was developed by Chemstrand's Technical Sales Service Department. According to the company, it is expected to provide the first practical solution to many of the pleating industry's problems created during processing chemical textile or thermoplastic fabric blends.

Besides eliminating or appreciably reducing detrimental manifestations of cockling, puckering, rippling or bubbling in these fabrics, ChemPleat also produces sharper and more durable pleats, it is claimed. It is further claimed that it significantly inhibits the build-up of shine or glaze and affords greater control of the pleated fabric, thus insuring a more uniform distribution of temperature and moisture during the operation.

According to Chemstrand, the process does not require the use of additional machinery because the "heart" of the process consists of a two-stage technique embodying simple, regular equipment used extensively in pleating establishments today.

This technical advance, it was also noted, not only improves the pleatability of fabrics made with Chemstrand's fibers, but it is equally effective in improving the pleating quality of other man-made and thermoplastic fibers used throughout the industry.

Complete technical information concerning the process is available to the trade upon request to The Chemstrand Corp, Technical Sales Service Department, 350 Fifth Avenue, New York 1, NY.

Visco Black BAW

Visco Black BAW is a new Sandoz dye for use on viscose and on viscose acetate blends when a good acetate reserve is desired. Fastness to light, water, crocking, perspiration, drycleaning and hot wet processing are said to be highly rated. It is recommended by Sandoz for viscose lining materials and viscose automotive carpeting. Sandoz customer leaflet T-8184, available from the company's district sales offices, contains a swatch and figures on fastness.

Courtaulds Announces Two New Textile Fibers

Courtaulds (Alabama) Inc, has introduced two new fibers called, respectively, Corval and Topel. Both fibers are members of a new family of cross-linked cellulosic fibers with properties distinctly different from those of rayon, acetate or cotton.

Corval reportedly has the advantage of giving loft, warmth and kindness of hand and is particularly recommended by Courtaulds for improving the aesthetic properties of synthetic fibers and also for blending with wool. Intensive development work is proceeding and many other uses are being investigated. Corval is priced at 40¢ per pound and reportedly will be available in bright and dull, regular and crimped, and in all standard deniers, up to and including 15.

Topel is designed for use alone or in blends with cotton, acetate and nylon and will be sold at 34¢ per pound. Because of its reported relatively low elongation at break and its high resistance to alkalis, it is considered to be a particularly good fiber for blending with cotton to which it is said to impart improved appearance, hand and drape. It will be available only in uncrimped form in 1½ and 3 deniers and in both bright and dull.

According to Courtaulds' announcement, the following properties are common to both fibers, though generally Corval possesses these attributes to a greater extent than Topel:

1) Water absorption and swelling properties comparable with those of cotton. This property permits both fibers to be yarn dyed in 100% form either on packages or beams.
2) Substantial elimination of progressive shrinkage.
3) Similar dry tenacity to that of rayon with a higher tenacity when wet.
4) Elongation at break intermediate between that of cotton and rayon.
5) Good resistance to caustic alkalis and can be mercerized in blends with other synthetic fibers.
6) Can be resin treated with a wide range of cross-linking materials to obtain good wrinkle resistance.
7) May be dyed with all the normal dyestuffs used for cellulosic fibers.

312″ Pin Tenter

Knickerbocker Dye Corp, 3860 Park Ave, Bronx 57, NY, has completed construction of a 312″ wide pin tenter frame for finishing goods as wide as 288 inches, such as tricot and raschel types. According to Sam Potrock, president, this is the widest frame in the country, comparing with standard widths of 216 inches.

The frame was built on the company's premises by Mr Potrock and his brother Herman, who is secretary-treasurer of the firm. It reportedly is equipped with automatic controls and safety features, is approximately 85 feet long, and runs 90 ypm. Running goods 288″ wide (finished width), it has a reported capacity of 720 yards per minute. Goods of this width are being especially woven for the firm. The Potrock brothers point out that, because of the sharply increased production, cost of finishing the goods is materially reduced.

An additional feature of the new frame is that, despite its width, there is no sag in the rolls as the goods come off the machine.

New Service in Electrical Panel Design

Turbo Machine Company, Lansdale, Pa, has announced a new service in the design and building of electrical control and instrument panels.

Turbo will design and fabricate the panelboards to meet individual requirements for electrical, electro-mechanical, pneumatic, hydraulic controls and instrumentation, or any combination of controls and instruments. The Company's engineering staff is equipped to work from customers' drawings, recommending changes where practical, or to work directly with the customer in analyzing his problems and designing panels to meet them.

Panels for both automatic and manual control with interlocking operation can be supplied. Turbo also has facilities to provide special devices for panels when they are needed and to modify existing equipment. It is reported that all types of enclosures are available, including explosion-proof, moisture-proof, dust-proof, and other special types.

Turbo has been producing control panels for its own machines for many years.

A folder, "Turbo Custom-Designed Control Panels," is available from the manufacturer.

Phobotex FTA

A new Ciba durable finish for textiles, Phobotex FTA is said to provide a fast-to-washing water repellent finish with little or no effect on air permeability. It is effective on all natural man-made fibers. It is stated that it may be applied alone or in combination with the urea-formaldehyde or melamine-formaldehyde resins for spot-resistant, fully water repellent, drip-dry, or wash and wear finishes. The use of Phobotex FTA in resin finishes is said to give greatly improved sewability, and in some instances it has been used for this effect alone.

Application is very simple. It follows the usual procedures for applying the curing types of resins. However, it is stated, no unpleasant odors develop during processing or storage, and it is not necessary to wash goods after curing. Phobotex FTA is supplied as a soft waxy material which is 100% active. It melts readily in hot water and in the presence of acetic or tartaric acid, forms a very fine, oil-in-water emulsion. Stock emulsions containing 25% Phobotex FTA may be stored for long periods. For full, washfast, water-repellent effects, 4-5% Phobotex FTA should be applied on cellulosic and other natural fibers, and 2-3% on synthetic fibers. It is claimed that the use of 1-3% Phobotex FTA is all that is required in combination with resin finishes to give stain resistance, improved hand and better sewability.

Ethoquads

A new series of quaternized ethoxylated amines trademarked Ethoquads has been introduced by the Chemical Division of Armour and Company.

The new chemicals are said to be water-soluble, cationic surface-active agents with properties combining those of quaternary ammonium chlorides and ethoxylated fatty amines. They differ from the generally available quaternary ammonium compounds in the type of groups attached to the nitrogen.

It is expected the chemical and physical properties offered by these new quaternary ammonium chlorides will be useful in a variety of commercial applications.

Initial laboratory evaluation indicates they will be used as effective wetting agents, emulsifiers, dispersing and solubilizing agents, and as softening and antistatic agents.

For additional information, contact Armour and Co, Chemical Division, 1355 W 31st Street, Chicago 9, Ill.

Softyne R

Hart Products Corp, announces the availability of Softyne R, a new softener for use in all types of res n finishing of cottons, and rayons requiring high temperature curing cr mechanical polishing or embossing cperations. Softyne R is said to be a nonionic softener with extremely high resistance to yellowing at high temperatures. It is said to produce desirable softness and lubricating, to be completely free of chlorine retention and to increase the sewability characteristics of treated fabrics. It is available as a pure white paste. Samples and technical data sheets may be obtained by writing to Hart Products Corp, 1440 Broadway, New York 18, N Y.

Lauramine #20

Yarns and fabrics get a "quality boost" with the use of Lauramine #20 in finishing operations, according to Laurel Soap Manufacturing Company, Inc, Philadelphia, Pa. The company claims that package-dyed cotton yarns are given improved winding properties, greater softness, and better knitting qualities, while cotton fabrics gain superior hand and body, unusual softness, and improved cutting and sewing properties.

Lauramine #20 is an anionic paste-type softener and lubricant of high activity. It is said to be nonyellowing and reportedly does not affect shades of dyed goods. The manufacturer states that it forms an emulsion of such fine particle size that uniform application and lubrication are assured, and knitting quantities of woolen, worsted, and mixed yarns are vastly improved because of Lauramine #20's variety of outstanding characteristics.

New Hummel Offerings

Hummel Chemical Co Inc, 90 West St, New York 6, NY, is now offering a 30% anthraquinone paste for use in the manufacture of dyestuffs and other organic chemicals.

The firm is also offering barium acetate (99% minimum purity) in 100-lb polyethylene-lined fiber drums and barium chloride technical crystals in P/E-lined jute bags, 50 kilos net. Barium acetate is used in making other barium chemicals, as a textile dyeing mordant, etc. Barium chloride is used in the manufacture of dyes.

Also offered is gallic acid NF technical crystals. Gallic acid is used in the manufacture of dyes and also as a raw material in the manufacture of pyrogallol and bismuth subgallate.

Line-operated pH Meter

A compact new Hagan Line-Operated pH Meter, claimed to be ideal for fast continuous service over a wide range of field and laboratory applications, is now available from Hagan Chemicals & Controls, Inc.

The electronic unit measures 5½ x 6¼ x 2 inches. An auxiliary pointer permits checking of standardization without need of buffer solutions between measurements. After being plugged into a regular 100-125 volt, 50-60 cycle AC circuit, the meter is ready for operation in about three minutes.

Unlike simple colorimetric indicators, the meter reportedly covers a broad range of pH with high sensitivity. Color, turbidity or chlorine in test samples will not affect readings, it is claimed.

For complete information, write Dept 410, Hagan Chemicals & Controls, Inc, Box 1346, Pittsburgh 30, Pa.

Paper Thermometers

Thermopaper and Thermotube disposable paper temperature indicators are now available for 100, 105 and 110°F to supplement a previously offered range of 115 through 490°F. These indicators measure temperature by exhibiting an irreversible color change when subjected to predetermined temperatures. Speed of response is said to be less than a tenth of a second and accuracy is reported to be one percent.

The indicators are being used for measuring temperatures during curing of resins in fabrics, curing of screen-printed textiles, drying of fabrics, heat setting of fabrics, coated fabrics in fusing units, etc.

A brochure detailing uses, temperatures and prices is available on request from Paper Thermometer Co, 10 Stagg Drive, Natick, Mass.

Hodag Offering Silicone Antifoams

A new series of silicone antifoams now available from Hodag Chemical Corp, 7247 N Central Park Chicago 45, Ill, are claimed to give the user all the efficiency of standard silicone antifoams at a substantial cost saving.

Hodag engineers claim several advantages to their silicone antifoams: 1) silicone antifoams disperse immediately to provide quick foam knockdown; 2) they are supplied as concentrates ready to use on delivery, or for quick, convenient dilution; 3) they last longer, making them ideal for continuous processing; and 4) they have a long storage life, can be frozen, boiled, or sterilized without losing effectiveness.

• NAMES IN THE NEWS •

Dicome

Dawson

Lusignea

Lavender

Will Dicome, assistant manager, textile industry sales, Dow Corning Corp, is now located in New York.

Mr Dicome's transfer has been made, it is reported, "to enable Dow Corning to better serve the needs of the industry through closer and more frequent contact with top levels of mill and manufacturer management." Mr Dicome will maintain close liaison with **William T Rossiter**, manager of leather and textile sales, who will remain in Midland.

Mr Dicome, who has been with Dow Corning for five years, was previously with the technical service department of Chas Pfizer & Co, Inc. He will work out of the Dow Corning branch office at 600 Fifth Avenue, New York.

Fred C Hoehn and **John S Robinson** have been appointed sales representatives for Becco Chemical Division, Food Machinery and Chemical Corporation, Buffalo, NY.

Mr Hoehn will be serving customers in the Mid-West territory, traveling out of the Decatur-Springfield, Ill area. He has been with Becco since 1956.

Mr Robinson has been assigned to the New England territory, and will work out of Becco's district office in Framingham, Mass. He joined Becco in 1940 as a laboratory assistant, and later promoted to research chemist.

William L Triplett has been appointed to the Customer Service Technical Staff of the Chemicals and Dyestuffs Division, Koppers Co, Inc. Mr Triplett comes to Koppers from Burlington Industries Corp, where he was superintendent of a finishing plant.

Mr Triplett will be available primarily to offer technical assistance to large textile mills throughout the South. However, he will also act as consultant to customers of Koppers Co, Inc, particularly in matters that pertain to synthetic fibers.

Clinton W Dawson, plant manager of Franklin Process Yarn Dyeing Division of Indian Head Mills in Providence, RI, until its recent liquidation, is now located at the Philadelphia plant of the same company in the same capacity. He succeeds **M E Davis**, who passed away June 22nd.

Richard B Lusignea, formerly sales analyst of the Franklin Process Division and also located at the Providence plant until its closing, has been transferred to Philadelphia as director of sales for the Franklin Process Division with plants located in Philadelphia, Greenville, Chattanoga and Fingerville, SC.

Herbert S Kishbaugh has been named assistant manager, New York Sales branch, Solvay Process Division, Allied Chemical Corp.

In his new post, Mr Kishbaugh, who has been assigned to the New York sales branch since 1956, will be located at 261 Madison Avenue. He will assist in the management of Solvay Process sales activities in the Metropolitan Area and New Jersey.

Thomas L Wilson has been appointed manager of the year-old, multi-million dollar Research Center of United States Rubber Co in Wayne, NJ, replacing **Arthur E Brooks**, who was recently appointed an assistant director of the research and development department.

Basic and applied research in textiles, rubber, plastics, and chemicals for all of the operating divisions of the rubber company are conducted at the Research Center.

Dr Wilson joined the company's general laboratories in 1935 as a research chemist. He was appointed head of the laboratory's information and patent department in 1947. In 1954 was named administrative assistant to the director of research and development, the post he held before receiving his new assignment.

Putnam Chemical Corp, Beacon, NY, United States distributors of the dyestuffs, dyestuff intermediates, textile auxiliaries and waxes of Badische Anilin & Soda Fabrik AG, Ludwigshafen am Rhein, Germany, has announced the addition to its southern sales staff of **William B Lavender**.

Mr Lavender has been active in the textile industry for many years both in the technical and sales fields.

In a move to gear its executive staff to a major expansion program currently underway, the board of directors of Jefferson Chemical Company, Inc has elected an executive vice president and two new vice presidents.

John D McPherson, formerly vice president, operations, becomes executive vice president; **Donald L Griswold**, formerly general manager, marketing department, is vice president for marketing; and **Lynn R Strawn**, formerly general manager of manufacturing, is vice president of manufacturing.

In their new posts, these officers will play key roles in further development of the Company's expansion program, which is tripling production facilities for ethylene, doubling the plant's capacity for ethylene glycol, increasing by 50 percent the production of ethylene oxide, and stepping up output of a number of other chemicals, as well as bringing Jefferson into the production of several new products. The expansion, announced in November, 1956, is scheduled for completion this year.

L Frank Dowding succeeds Mr Strawn as general manager of manufacturing. Since 1955, Mr Dowding has been assistant general manager of manufacturing and has been responsible for the design and excution of the company's expansion program.

Jefferson Chemical Company is owned equally by American Cyanamid Company and The Texas Company.

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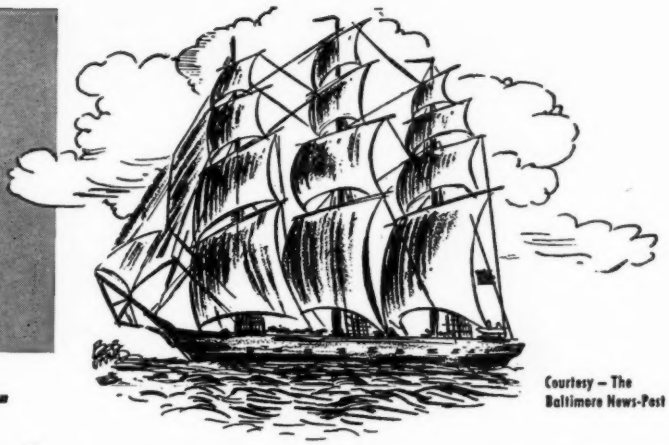

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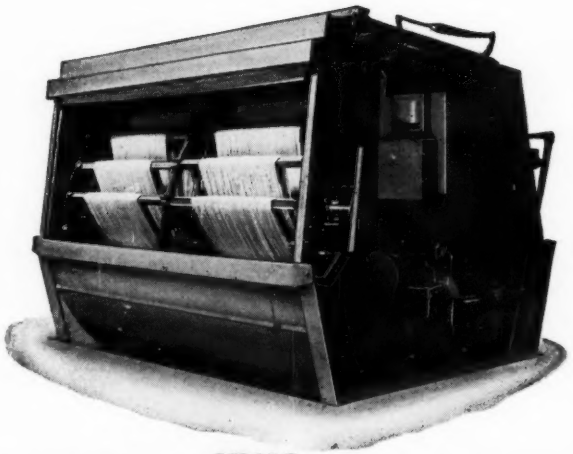

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Your prepaid subscription received promptly will insure complete delivery this year of this tremendously valuable work on the free world's dyestuffs and pigments in commercial use. Published by the Society of Dyers and Colourists (British) and the American Association of Textile Chemists and Colorists, these four volumes represent ten years of intensive work in assembling and editing the data. They include approximately 3000 pages of application and fastness properties of coloring matters as furnished by world manufacturers, chemical and structural information. characteristic reactions, index of products and trade names, fastness tests and rating methods, new and old COLOUR INDEX NUMBERS, Schultz and AATCC prototype numbers and a Hue Indication Chart.

Further Particulars from

American Association of Textile Chemists and Colorists

PO Box 28, Lowell, Massachusetts

Workman

Greene

Hart

Shapiro

Robert E Workman, former manager of the Chemical Division of the Goodyear International Corp, a subsidiary of The Goodyear Tire & Rubber Company, has been appointed to the newly created post of assistant general manager of the Goodyear Chemical Division.

Workman, who has been on leave of absence the past year while participating in the executive development program at Massachusetts Institute of Technology under a Sloan Fellowship, returned to take up his new duties July 1.

Fred N Roberts has been appointed to the newly-created position of coordinator, market research, of National Starch Products Inc, New York. Creation of this post is tied in with the company's diversification in recent years and its growth into a multiple-division organization. Mr Roberts will serve as staff assistant to **James Dillon**, senior vice president in charge of long-range planning and growth. He will coordinate all of National's marketing, sales planning and market research activities. He has been active in both the chemical and market research fields and holds patents in fluorochemistry.

Hohing

Conrad Hohing has been appointed quality control superintendent for the Onyx Oil & Chemical Co, Jersey City 2, N J. Mr Hohing was formerly supervisor of development and utilization of yarn lubricants for the Celanese Corp of America at its Cumberland, Md, plant. In his new position he will be responsible for product quality control, a function which is being expanded and emphasized at Onyx.

Hart Products Corp, New York, has announced the following new appointments:

Milton J Greene has been named director of the company's newly expanded Textile Resin Division. Mr Greene joined Hart Products in 1950 and most recently has been in charge of the New England office. He will continue to make his headquarters in New Bedford, Mass.

Thomas H Hart has been appointed director of customer service and sales research for the marketing of the company's new mothproofing agent, Larvatex. Mr Hart has been with the company since 1944 and has headed the Pennsylvania sales office for many years.

Dr Clarence P Harris has joined Finetex Incorporated, East Paterson, N J, as research director. Dr Harris is in charge of the new research laboratories, which are now fully equipped to develop new products. He is a licensed professional engineer and was previously employed by E I du Pont de Nemours & Co, Inc, Sandoz, Inc and Apex Chemical Company.

OBITUARY

W HALE CHURCH

W HALE CHURCH, who directed the research that led to development of moisture-proof cellophane and various synthetic fibers for the Du Pont Company, died July 25th, following a stroke suffered at his home in Chadd's Ford, Pa, on July 13th. He was 60.

At the time of his death, Dr Church was director of the Pioneering Research Laboratory, which he had organized subsequent to the work on cellophane. In this capacity he administered a broad research program in the Textile Fibers Dept directed chiefly toward the development of new types of synthetic fibers.

Dr Church was closely identified with the early pioneering work on Orlon acrylic fiber and Dacron polyester fiber. He also led the early pioneering research on Du Pont's newest fiber, Fiber K, which is a synthetic elastomer textile fiber with rubber-like properties, announced on April 21 of this year.

His outstanding work was recognized by the award of Columbia University's Charles Frederick Chandler medal and the Jacob Schoellkopf Gold Medal.

Dr Church joined Du Pont as a chemist at the Yerkes rayon plant, Buffalo, NY, in January, 1925.

Leonard Shapiro has joined the staff of Roma Chemical Corp, East Newark, NJ, as technical director. Mr Shapiro has an extensive background in pigments, resin formulations, and dispersions. For more than twenty years he has been active in research and development in pigment manufacturing. He was instrumental in the development of pigment and resin substitutes during the war. He will be in charge of the development of new products.

William B Rose has been named European technical representative for the Chemical Divisions of Food Machinery and Chemical Corporation in Geneva, replacing **Charles P Roberts**, who had held the position for the past three years. Dr Roberts is being transferred to FMC's Chemical Divisions headquarters in New York. He will continue to be concerned with coordinating European and FMC Chemical Divisions interests in the technical field.

Before his present appointment, Mr Rose was director of research and development for the Westvaco Chlor-Alkali Division. His association with FMC began in 1935, and includes experience in a variety of research and development positions.

Clemson College has announced the awarding of the following additional scholarships for 1958-59:

$250 Seydel-Woolley Scholarship in textiles to **William G Emory**, a senior in textile engineering who attended Clemson last year on the American Viscose Scholarship;

$400 Keever Starch Scholarship to **John D Tucker**, a senior in textiles;

$500 Chemstrand Corp scholarship to **David A Powers**, a senior in textiles;

$500 South Carolina Textile Manufacturers Association scholarships to **James W Davidson**, who will enter Clemson in September as a freshman, and **James L Adams**, a sophomore whose 1957-58 scholarship has been renewed.

TECHNICAL LITERATURE

(Literature is available from sources shown in italics)

CATIONIC DYE LEVELER—*Nopco Chemical Co, Textile Chemicals Div, 60 Park Place, Newark, N J*———New information on this dye leveler for acid colors on nylon tricot and wool is contained in this data bulletin TX-34. Called Nopco 1425-B, the product is a liquid cationic surfactant that levels acid dyestuffs (including milling and premetallized acids) as well as direct and vat colors. Nopco 1425-B helps to prevent the cause of barré marks on unevenly dyed nylon and also saves stripping costs when used to correct overdyed lots, it is claimed.

CHEMICAL PRODUCTS LIST—*Hummel Chemical Co, Inc, 90 West St, New York 6, N Y*———A product list of approximately 400 industrial chemicals and organic intermediates now being offered. Of special interest to dyestuff manufacturers are the organic intermediates, some of which are not offered elsewhere.

CHOOSING THE RIGHT POLYGLYCOL—*Technical Service and Development, The Dow Chemical Co, Midland, Mich*———This 24-page revised edition has been published by Dow because of increasing customer interest in its polyglycols, which it identifies as members of its "family of polyols." New members are being added to the family each year.

Polyglycols are high-molecular-weight compounds produced by reacting alkylene oxides with compounds having an active hydrogen. They are relative newcomers on the chemical scene.

Among the polyols described in this booklet are polyethylene glycols, polypropylene glycols, polybutylene glycols, polyepichlorohydrins, polystyrene glycols and miscellaneous polyglycols, including five new trihydroxy polypropylene glycols. Dow includes synthetic glycerine among its polyols, although its properties and uses are not presented in this booklet.

Many variations of these groups are possible, dependant upon the type of starting materials used. Dow, which is basic in the oxides, primary materials for making polyglycols, foresees an unlimited number of variations possible for many uses.

The polyols are used as intermediates or formulating ingredients in the making of dye solvents, antifoam agents, surface-active agents, textile lubricants, sizes, softeners, urethane compounds, and many other uses.

EMULSIFIABLE A-C POLYETHYLENE—*Semet-Solvay Petrochemical Division, Allied Chemical Corp, 5th Floor T, 40 Rector St, New York 6, N Y*——— A 16-page booklet on the use of this product as a textile finishing agent. According to Allied, the brochure contains all the information needed by a textile chemist to adapt Emulsifiable A-C Polyethylene to his particular process. Listed are product properties, instructions on the preparation of emulsions, suggested formulations, notes on how to manufacture large-scale batches, and application methods. Also included are tables covering the effect of the emulsion with crease-proofing resins, effect of the emulsion on natural and synthetic fibers, and tear strength, durability and scorch resistance on treated cotton. The emulsion is said to improve the following properties in fabrics: hand, tear strength, crease recovery, abrasion resistance and faster sewing rates.

LAMITEX L—*Croda Inc, 15 East 26th St, New York 10, NY*———This 4-page brochure is devoted to Lamitex L, described as "an extremely pure form of sodium alginate specially produced for the textile printing industry."

Properties, characteristics, application details, and recipes are included.

NOPCONE AR BULLETIN—*Nopco Chemical Co, Textile Chemicals Div, 60 Park Place, Newark, N J*———An antistatic lubricant for processing synthetic filament yarns is discussed in this bulletin. Nopcone AR is a balanced coning oil said to be approved for use on yarns like Du Pont's Taslan and Bancroft's Ban-Lon. Added to its antistatic effects, the product is said to be low in viscosity, have good spreading power and to be easily removed. It is stated that goods treated with this product and then stored will not become rancid or yellow, even after long periods.

TEXTILE FINISHING WITH CELANESE POLYVINYL ACETATE EMULSIONS—*Celanese Plastics Div, 744 Broad St, Newark 2, NJ*———Technical bulletin (NP-28) describes results obtainable with Celanese polyvinyl acetate emulsions in finishing fabrics of cotton and of man-made fibers. It includes a description of the emulsions, their advantages and application procedures. Information on storage and handling and compounding materials and sources also is included.

THE USE OF STAINLESS STEEL IN THE CHEMICAL INDUSTRY — *Advertising Dept, Allegheny Ludlum Steel Corp, Oliver Bldg, Pittsburgh 22, Pa*——This 40-page, completely revised booklet includes special sections on the process industries, the plastics industry, petrochemical industry, detergents manufacturing, the nuclear power industry and others.

Diagrams and photographs are included in the booklet. A special comparative table on stainless steels and a table on the corrosion resistance of Allegheny Ludlum stainless steels to various media are included.

General Calendar

AMERICAN OIL CHEMISTS SOCIETY
Oct 20-22 (Sherman Hotel, Chicago); April 20-22, 1959 (Roosevelt Hotel, New Orleans, La; Sept 28-30, 1959 (Statler Hotel, Los Angeles, Calif)

AMERICAN SOCIETY FOR TESTING MATERIALS (COMMITTEE D-13)
Oct 14-17 (Sheraton McAlpin Hotel, New York, N Y)

DIVISION OF CLOTHING AND TEXTILES IN EXTENSION, TEACHING AND RESEARCH, UNIVERSITY OF GEORGIA
Nov 7-8 (2nd Textile Seminar, Georgia Center for Continuing Education, Athens, Ga)

DRUG, CHEMICAL & ALLIED TRADES SECTION, NYBT
Sept 11-14 (Annual meeting, Sagamore Hotel, Bolton Landing, Lk George, NY)

THE FIBER SOCIETY
Sept 9-10 (Montreal, Que); April 29-30, 1959 (Fontana Village, NC)

INSTITUTE OF TEXTILE SCIENCE
Sept 8 (Sixth Scientific Session, McGill Univ, Montreal, Que)

INTERNATIONAL TEXTILE MACHINERY EXHIBITION
Oct 15-25 (Belle Vue, Manchester, England)

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
August 25-29 (Summer course in "The Mechanics of Textile Structures")

NATIONAL COTTON COUNCIL OF AMERICA
Oct 1-2 (Chemical Finishing Conference, Washington, DC)

SOUTHERN TEXTILE EXPOSITION
Oct 6-10 (Greenville, SC)

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES
Luncheon meetings at the Hotel Roosevelt, New York, NY: Sept 9, Oct 8, Nov 12